PHYTOCHEMISTRY

THE INTERNATIONAL JOURNAL

OF PLANT BIOCHEMISTRY

Executive Editors
J. B. HARBORNE
T. A. SMITH
T. SWAIN

Volume 26 Contents, Author Index and
Subject Index 1987

PERGAMON PRESS

OXFORD · NEW YORK
BEIJING · FRANKFURT · SÃO PAULO · SYDNEY · TOKYO · TORONTO

PHYTOCHEMISTRY

The International Journal of Plant Biochemistry

(1 volume per annum of 12 issues)

Editor-in-Chief

J. B. HARBORNE: Dept. of Botany, The University, Whiteknights, Reading, RG6 2AS, Berks., U.K.

Founding Editor

T. SWAIN†: Jodrell Laboratory, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3DS, U.K.

Executive Editor

T. A. SMITH: Long Ashton Research Station, Bristol, BS18 9AF, U.K.

Associate Editors

L. J. GOAD: Dept. of Biochemistry, Liverpool University, Liverpool, L69 3BX, U.K.
P. J. HOLLOWAY: Long Ashton Research Station, Bristol, BS18 9AF, U.K.
D. R. THRELFALL: Dept. of Plant Biology, University of Hull, Hull, HU6 7RX, U.K.
C. A. WILLIAMS: Dept. of Botany, The University, Whiteknights, Reading, RG6 2AS, Berks., U.K.

Production Controller

S. E. HAMMOND: Journals Production Dept., Pergamon Journals Ltd., Headington Hill Hall, Oxford, OX3 0BW, U.K.

EDITORIAL BOARD—1988

Y. Asakawa:	Faculty of Pharmaceutical Sciences, Tokushima Bunri University, Yameshiro-cho, 770 Tokushima, Japan.
E. A. Bell:	Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, U.K.
E. G. Brown:	Dept. of Biochemistry, University College of Swansea, Singleton Park, SA2 8PP, U.K.
E. E. Conn:	Dept. of Biochem. and Biophys., University of California, Davis, CA 95616, U.S.A.
G. Cordell:	Program for Collaborative Research in the Pharmaceutical Sciences, College of Pharmacy, University of Illinois at Chicago, IL 60612, U.S.A.
L. Fowden:	Rothamsted Experimental Station, Harpenden, Herts., U.K.
T. W. Goodwin:	Dept. of Biochemistry, University of Liverpool, Liverpool, L69 3BX, U.K.
O. R. Gottlieb:	Instituto de Quimica, Universidade de São Paulo, C.P. 20780, São Paulo, Brazil.
V. Herout:	Dept. of Nat. Products, Inst. Org. Chem., Flemingovo N2, Praha 6, Czechoslovakia.
W. Herz:	Dept. of Chemistry, The Florida State University, Tallahassee, FL 32306, U.S.A.
K. Hostettmann:	Institut de Pharmacognosie et Phytochemie, Ecole de Pharmacie de l'Université, Rue Vuillermet 2, CH-1005 Lausanne, Switzerland.
E. Leete:	School of Chemistry, University of Minnesota, Minneapolis, MN 55455, U.S.A.
M. Luckner:	Sektion Pharmazie, Universität Halle (Saale), East Germany.
T. J. Mabry:	Dept. of Botany, University of Texas at Austin, TX 78712, U.S.A.
P. Mazliak:	Lab. de Physiologie Cellulaire, Université Pierre et Marie Curie, 75005 Paris, France.
B. V. Milborrow:	Dept. of Biochemistry, University of N.S.W., P.O. Box 1, Kensington, Australia.
G. Ourisson:	Centre de Neurochimie, C.N.R.S., 5 rue Blaise Pascal, 67084 Strasbourg, France.
J. D. Phillipson:	School of Pharmacy, University of London, 29/39 Brunswick Square, London WC1N 1AX, U.K.
T. ap Rees:	Botany School, University of Cambridge, Downing Street, Cambridge, U.K.
J. Tempe:	Institut de Microbiologie, Université de Paris-Sud, Institut de Microbiologie, Centre d'Orsay, 91405 Orsay, France.
G. H. N. Towers:	Dept. of Botany, University of British Columbia, Vancouver 8, B.C., Canada.
H. Wagner:	Inst. für Pharmazeutische Biologie, Karlstrasse 29, 8 München 2, West Germany.
P. G. Waterman:	Phytochemistry Research Laboratories, Dept. of Pharmacy, University of Strathclyde, 204 George Street, Glasgow G1 1XW, U.K.
M. H. Zenk:	Inst. für Pharmazeutische Biologie, Karlstrasse 29, 8 München 2, West Germany.

All manuscripts and contributions should be submitted to J. B. HARBORNE at Reading. Authors in North America may send their manuscripts to Prof. G. CORDELL, Program for Collaborative Research in the Pharmaceutical Sciences, College of Pharmacy, University of Illinois at Chicago, IL 60612, U.S.A. for onward transmission. Authors are earnestly required to consult the latest 'Instructions to Authors', which are published in Vol. 26, No. 1. (Copies of these instructions are available from the Reading office.) Review articles are welcomed, but intending Authors should send an outline to one of the Editors before preparing their manuscripts. Books for review should be sent to J. B. HARBORNE.

This journal has been designated an official organ of the 'The Phytochemical Society of Europe' and Society announcements will appear at regular intervals. A reduced subscription rate is available to members of the Phytochemical Society of Europe who should make application to the Secretary of the Society.

Publishing and Advertising Offices: Headington Hill Hall, Oxford, OX3 0BW, U.K. *Annual Institutional Subscription Rate* (1988): DM 1250.00 (including postage and insurance). *Two Year Institutional Rate* (1988/89): DM 2375.00. Personal subscription rate for those whose library subscribes at the regular rate: DM 185.00. Prices are subject to change without notice. Subscription enquiries from customers in North America should be sent to: Pergamon Journals Inc., Maxwell House, Fairview Park, Elmsford, NY 10523, U.S.A., and for the remainder of the world to: Pergamon Journals Ltd., Headington Hill Hall, Oxford, OX3 0BW, U.K. *Microform Subscriptions and Back Issues:* Back issues of all previously published volumes are available in the regular editions and on microfilm and microfiche. Current subscriptions are available on microfiche simultaneously with the paper edition and on microfilm on completion of the annual index at the end of the subscription year.

It is a condition of publication that manuscripts submitted to this journal have not been published, and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the Publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform, or any other reproductions of similar nature, and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

PHOTOCOPYING INFORMATION FOR USERS IN THE U.S.A.
The Item-Fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of $3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-Fee Code for this publication is: 0031–9422/88 $3.00 + 0.00

Copyright © 1988 Pergamon Journals Ltd.

CONTENTS OF VOLUME 26

Number 1

Announcements	1	
Instructions to Authors—1987	3	
Review Article Number 22 Polyphenol oxidases in plants—recent progress	11	A. M. MAYER
Growth and Metabolism Transport properties of bean vesicles in the presence of fungal components	21	H. M. GRIFFITHS, D. P. BRISKIN and A. J. ANDERSON
Synthesis and cytokinin-like activity of 7-chloro-imidazo[1,2-*c*]-pyrimidines	25	C. BRANCA, C. A. MAGGIALI, G. MORINI, F. RONCHINI, D. RICCI and V. SCOCCIANTI
Stimulation of RNA synthesis in cowpea (*Vigna sinensis*) seedlings by gibberellic acid and adenosine 3′,5′-cyclic monophosphate	31	H. C. KAPOOR
Calmodulin from *Citrus sinensis*: purification and characterization	37	I. A. DUBERY and J. C. SCHABORT
Structural homology among the major 7S globulin subunits of soybean seed storage proteins	41	H. HIRANO, H. KAGAWA, Y. KAMATA and F. YAMAUCHI
Constancy of composition of storage proteins deposited in *Pisum sativum* seeds	47	J.-C. HUET, J. BAUDET and J. MOSSÉ
Carrot phytoalexin inhibits Ca^{2+}, calmodulin-dependent protein phosphorylation in carrot cells	51	M. AMIN, F. KUROSAKI and A. NISHI
Acid phosphatase from maize scutellum: properties as a function of seed germination	55	A. M. TENO, M. S. PALMA and A. ROSSI
Membrane-bound nucleolytic activity of corn root cells	59	T. SAWICKA
Metal ion inhibition of corn root plasma membrane ATPase	65	S.-I TU and J. N. BROUILLETTE
Superoxide dismutase in wounded etiolated pea seedlings	71	J. A. OLSEN and C. R. COOK
Chromatographic and electrophoretic analyses of papaya proteinases	75	P. W. GOODENOUGH and J. OWEN
Changes in CTP:cholinephosphate cytidylytransferase protein levels in pea stems treated with indole-3-acetic acid	81	M. J. PRICE-JONES and J. L. HARWOOD
Metabolism of glucose and gluconate in fast- and slow-growing rhizobia	85	S. K. CHAKRABARTI, A. K. MISHRA and P. K. CHAKRABARTTY
Aldehyde metabolism and the aroma quality of stored Golden Delicious apples	89	H. L. DE POOTER, M. R. VAN ACKER and N. M. SCHAMP
Dihydroconiferyl alcohol in developing xylem of *Pinus contorta*	93	R. A. SAVIDGE
Ecological Biochemistry Binding of 1,2,3,4,6-pentagalloylglucose to proteins, lipids, nucleic acids and sugars	95	M. TAKECHI and Y. TANAKA
Tannic acid and proteolytic enzymes: enzyme inhibition or substrate deprivation?	99	S. MOLE and P. G. WATERMAN
Iridoid glycosides in the butterfly *Euphydryas cynthia* (Lepidoptera, Nymphalidae)	103	A. FRANKE, H. RIMPLER and D. SCHNEIDER
Biosynthesis Accumulation and enzymatic synthesis of 2-*O*-acetyl-3-*O*-(*p*-coumaroyl)-*meso*-tartaric acid in spinach cotyledons	107	D. STRACK, J. HEILEMANN, B. BOEHNERT, L. GROTJAHN and V. WRAY
Biogenetic relationships between ketocarotenoids and sporopollenins in green algae	113	J. BURCZYK
Cell wall carotenoids in green algae which form sporopollenins	121	J. BURCZYK
Biosynthesis of triterpenoid hydrocarbons in the B-race of the green alga *Botryococcus braunii*. Sites of production and nature of the methylating agent	129	P. METZGER, M. DAVID and E. CASADEVALL

Enzymatic synthesis of sulphated flavonols in *Flaveria* 135 L. Varin, D. Barron and R. K. Ibrahim

Cell Culture and Biotechnology

Esterification of 3-nitropropanoic acid to glucose by suspension cultures of *Coronilla varia* 139 B. G. Moyer and D. L. Gustine

Formation of gallotannins in callus cultures from oak (*Quercus robur*) 141 I. Krajci and G. G. Gross

Growth and alkaloid production of callus culture induced from *Securinega suffruticosa* 145 A. Ide, K. Nagano, N. Tanaka, K. Iwasaki, Y. Yamane, D. Koga, K. Yagishita, K. Nakao, Y. Kurisu, N. Fujioka, H. Kohda, H. Miyagawa and K. Yamasaki

Chemotaxonomy

Identification of date (*Phoenix dactylifera*) cultivars by protein patterns 149 H. Stegemann, A. E.-M. M. R. Afify and K. R. F. Hussein

Distribution of the pigment caulerpin in species of the green alga *Caulerpa* 155 J. G. Schwede, J. H. Cardellina II, S. H. Grode, T. R. James, Jr. and A. J. Blackman

6β-Lactonized xanthanolides from *Ratibida* species 159 E. Ellmauerer, V. P. Pathak, J. Jakupovic, F. Bohlmann, X. A. Dominguez, R. M. King and H. Robinson

Photoactive furocoumarins in fruits of some umbellifers 165 O. Ceska, S. K. Chaudhary, P. J. Warrington and M. J. Ashwood-Smith

Systematic implications of chromenes and benzofurans from *Encelia* (Asteraceae) 171 P. Proksch and C. Clark

Ceratiolin and other flavonoids from *Ceratiola ericoides* 175 N. Tanrisever, F. R. Fronczek, N. H. Fischer and G. B. Williamson

Flavonoid aglycones from the leaf surfaces of some *Achillea* species 181 E. Wollenweber, K. M. Valant-Vetschera, S. Ivancheva and B. Kuzmanov

Plant Chemistry

Hydrocarbons from the essential oil of *Cymbopogon martinii* 183 E. M. Gaydou and R. P. Randriamiharisoa

Pyrone derivatives from *Podolepis hieracioides* and sesquiterpene acids from *Cassinia longifolia* 187 C. Zdero, F. Bohlmann, R. M. King and H. Robinson

Flavonoids and terpenoids of *Chenopodium graveolens* 191 R. Mata, A. Navarrete, L. Alvarez, R. Pereda-Miranda, G. Delgado and A. R. de Vivar

Sesquiterpene lactones from *Perityle vaseyi* 195 R. M. Pfeil, D. A. Gage, E. F. Lee, M. Miski, T. J. Mabry and A. M. Powell

Guaiane sesquiterpenes from *Decachaeta scabrella* 199 M. Miski, D. H. de Luengo and T. J. Mabry

Helenanolides from *Gaillardia powellii* 201 W. Herz and M. Bruno

Perydiscolic acid, a germacranolide from *Perymenium* species 205 E. Maldonado, L. Mayorga and A. Ortega

Ten *cis*-clerodane-type diterpene lactones from *Gutierrezia texana* 209 F. Gao and T. J. Mabry

Triterpenoids from *Myrica rubra* 217 N. Sakurai, Y. Yaguchi and T. Inoue

Two triterpenoids from *Boehmeria excelsa* 221 M. L. Oyarzún, J. A. Garbarino, V. Gambaro, J. Guilhem and C. Pascard

Assignment of the ^{13}C NMR spectrum of quinovic acid	225	G. A. Miana and H. M. G. Al-Hazimi
Structure of desacylsaponins obtained from the bark of *Quillaja saponaria*	229	R. Higuchi, Y. Tokimitsu, T. Fujioka, T. Komori, T. Kawasaki and D. G. Oakenful
Isolation and structure of two cardiac glycosides from the leaves of *Nerium oleander*	237	S. Siddiqui, F. Hafeez, S. Begum and B. S. Siddiqui
Withaperuvins F and G, two withanolides of *Physalis peruviana* roots	243	P. Neogi, M. Sahai and A. B. Ray
Phenolic glucosides from *Prunus grayana*	249	H. Shimomura, Y. Sashida and T. Adachi
Prenylated coumarins and sesquiterpenoids from *Ferula communis*	253	M. G. Valle, G. Appendino, G. M. Nano and V. Picci
Coumarins from two *Coleonema* species	257	A. I. Gray, C. J. Meegan and N. B. O'Callaghan
Proanthocyanidins from the roots of *Fragaria vesca*	261	B. Vennat, A. Pourrat, O. Texier, H. Pourrat and J. Gaillard
Lignans from *Nectandra turbacensis*	265	M. G. De Carvalho, M. Yoshida, O. R. Gottlieb and H. E. Gottlieb
Neolignans from *Nectandra puberula*	269	J. C. Moro, J. B. Fernandes, P. C. Vieira, M. Yoshida, O. R. Gottlieb and H. E. Gottlieb
The caffeine–potassium chlorogenate molecular complex	273	R. Martin, T. H. Lilley, C. P. Falshaw, E. Haslam, M. J. Begley and D. Magnolato
Components of the galls on the leaves of *Pongamia glabra*: structures of pongagallone-A and pongagallone-B	281	R. Gandhidasan, S. Neelakantan, P. V. Raman and S. Devaraj
Ten homoisoflavanones from two *Muscari* species	285	M. Adinolfi, M. M. Corsaro, R. Lanzetta, G. Laonigro, L. Mangoni and M. Parrilli
Isorhamnetin 3-(2,6-dirhamnosylgalactoside)-7-rhamnoside and 3-(6-rhamnosylgalactoside)-7-rhamnoside from *Rhazya stricta*	291	W. K. Andersen, A. A. Omar and S. B. Christensen
Isoflavones from *Lupinus angustifolius* root	295	G. A. Lane and R. H. Newman
Steroidal alkaloid glycosides from *Lilium cordatum*	301	K. Nakano, K. Nishizawa, K. Murakami, Y. Takaishi and T. Tomimatsu
Steroidal alkaloids from *Solanum capsicastrum*	305	C. N. Lin, M.-I. Chung and S.-Y. Lin

Short Reports

The hydroxyproline content of gum exudates from several plant genera	309	D. M. W. Anderson, J. F. Howlett and C. G. A. McNab
Germacrane derivatives from the fruits of *Smyrnium creticum*	312	A. Ulubelen, N. Gören and J. Jakupovic
Sesquiterpene lactones from *Artemisia argentea*	314	N. A. El-Emary, M. A. Makboul and M. Hamed
Deacetoxybrachycarpone, a trinortriterpenoid from *Cleome brachycarpa*	315	V. U. Ahmad and K. A. Alvi
Two quassinoids and two coumarinolignoids from *Hannoa klaineana* roots	317	R. Vanhaelen-Fastré, L. Luyengi, M. Vanhaelen, J. P. Declercq and M. Van Meerssche

Neolignans from the fruits of *Licaria armeniaca* 319 J. M. Barbosa-Filho, M. Yoshida and O. R. Gottlieb

Coniferin—an astrigent glycoside in citrus 322 J. H. Tatum and R. E. Berry

Cyclopeptide alkaloids from *Melochia corchorifolia* 324 R. S. Bhakuni, Y. N. Shukla and R. S. Thakur

Number 2

Growth and Metabolism

Detection of abscisic acid, indole-3-acetic acid and indole-3-ethanol in seeds of *Dalbergia dolichopetala* 327 A. M. Monteiro, G. Sandberg and A. Crozier

Embryo-suspensor of *Tropaeolum majus*: identification of gibberellin A_{63} 329 P. Picciarelli and A. Alpi

Early DNA synthesis during the germination of wheat embryos 331 B. Marciniak, M. Bucholc and J. Buchowicz

Purification of a seed glycoprotein: *N*-terminal and deglycosylation analysis of phaseolin 335 H. E. Paaren, J. L. Slightom, T. C. Hall, A. S. Inglis and R. J. Blagrove

Purification and characterization of tomato lipoxygenase 345 R. Zamora, J. M. Olías and J. L. Mesías

Lipoxygenase–lipase system in oat hulls in relation to dormancy 349 M. Lascorz and R. Drapron

Subcellular localization of UDPG:nuatigenin glucosyltransferase in oat leaves 353 M. Kalinowska and Z. A. Wojciechowski

Characterization of β-galactosidases from the germinating seeds of *Vigna sinensis* 359 T. K. Biswas

Photochemical oxidation of snake gourd proteinase A_2, a serine proteinase 365 M. Kaneda, M. Kamachi and N. Tominaga

Ecological Biochemistry

Glycine–betaine accumulation influences susceptibility of water-stressed barley to the aphid *Schizaphis graminum* 367 G. E. Zúñiga and L. J. Corcuera

Antifungal compounds from *Dioscorea batatas* inoculated with *Pseudomonas cichorii* 371 M. Takasugi, S. Kawashima, K. Monde, N. Katsui, T. Masamune and A. Shirata

Biosynthesis

Effect of various inhibitors on biosynthesis of non-isoprenoid hydrocarbons in *Botryococcus braunii* 377 J. Templier, C. Largeau and E. Casadevall

Comparative study of the inhibition of sterol biosynthesis in *Rubus fruticosus* suspension cultures and *Zea mays* seedlings by *N*-(1,5,9-trimethyldecyl)-4α,10-dimethyl-8-aza-*trans*-decal-3β-ol and derivatives 385 M. Taton, P. Benveniste and A. Rahier

Cell Culture and Biotechnology

Cinchoninone:NADPH oxidoreductases I and II—novel enzymes in the biosynthesis of quinoline alkaloids in *Cinchona ledgeriana* 393 J. E. Isaac, R. J. Robins and M. J. C. Rhodes

Increased secondary product formation in plant cell suspension cultures after treatment with a yeast carbohydrate preparation (elicitor) 401 C. Funk, K. Gügler and P. Brodelius

Greening and shoot-differentiation related lipid changes in callus cultures of *Datura innoxia* 407 K. Manoharan, R. Prasad, and S. Guha-Mukherjee

Chemotaxonomy

Lipids of four species of freshwater dinoflagellates 411 N. Robinson, P. A. Cranwell, G. Eglinton and G. H. M. Jaworski

Iridoid glucosides in *Avicennia officinalis* 423 G. König, H. Rimpler and D. Hunkler

Steryl esters of liverworts 429 D. Takaoka, A. Matsuo and S. Hayashi

Alkaloids of the Rutoideae: tribe Diosmeae 433 W. E. Campbell, K. P. Finch, P. A. Bean and N. Finkelstein

Plant Chemistry

Eight aliphatic aldehydes from *Cirsium dipsacolepis* and their stereoselective synthesis 435 S. Takano and S. Kawaminami

Sesquiterpene xylosides from *Iphiona scabra* 439 M. G. El-Ghazouly, N. A. El-Sebakhy, A. A. Seif El-Din, C. Zdero and F. Bohlmann

Humulene derivatives from *Heterotheca villosa* 445 J. Jakupovic, R. Boeker, F. Bohlmann, R. M. King and H. Robinson

Carotane derivatives from *Ferula jaeschkeana* 449 S. N. Garg, L. N. Misra, S. K. Agarwal, V. P. Mahajan and S. N. Rastogi

Further sesquiterpene lactones from Costa Rican Eupatorieae 451 J. Jakupovic, V. Castro and F. Bohlmann

Modified helenanolides from *Psilostrophe gnaphaloides* and *Psilostrophe cooperi* 457 W. Herz and M. Bruno

Beyerene derivatives and other terpenoids from *Stevia aristata* 463 C. Zdero, F. Bohlmann and G. Schmeda-Hirschmann

Five grindelane diterpenoids from *Grindelia acutifolia* 467 B. N. Timmermann, J. J. Hoffmann, S. D. Jolad, R. B. Bates and T. J. Siahaan

Diterpenes from the red alga *Sphaerococcus coronopifolius* 471 F. Cafieri, L. de Napoli, E. Fattorusso and C. Santacroce

Neo-clerodane diterpenoids from *Baccharis macraei* 475 V. Gambaro, M. C. Chamy and J. A. Garbarino

Lasianthin, a *neo*-clerodane diterpenoid from *Salvia lasiantha* 479 A.-A. Sánchez, B. Esquivel, A. Pera, J. Cárdenas, M. Soriano-García, A. Toscano and L. Rodríguez-Hahn

Havardic acids A–F and havardiol, labdane diterpenoids from *Grindelia havardii* 483 S. D. Jolad, B. N. Timmermann, J. J. Hoffmann, R. B. Bates and T. J. Siahaan

Phloganthoside—a diterpene lactone glucoside from *Phlogacanthus thyrsiflorus* 491 A. K. Barua, S. Biswas, A. Patra, K. Basu, S. K. Panda and A. Ghosh

8(14),15-Sandaracopimaradiene-2α,18-diol, a minor constituent of the Rwandese medicinal plant *Tetradenia riparia* 493 L. Van Puyvelde, N. De Kimpe, F. Borremans, W. Zhang and N. Schamp

Ursane and oleanane triterpenoids from *Salvia argentea* 497 M. Bruno, G. Savona, J. A. Hueso-Rodríguez, C. Pascual and B. Rodríguez

Brassinosteroids and sterols from a green alga, *Hydrodictyon reticulatum*: configuration at C-24 503 T. Yokota, S. K. Kim, Y. Fukui, N. Takahashi, Y. Takeuchi and T. Takematsu

Two anthraquinone glycosides from *Cassia marginata* roots 507 Janhavi Singh and J. Singh

2′-(*E*)-*O*-*p*-Coumaroylgalactaric acid and 2′-(*E*)-*O*-feruloylgalactaric acid in citrus	509	B. Risch, K. Herrmann, V. Wray and L. Grotjahn
Gleinene and gleinadiene, 5,7-dimethoxycoumarins from *Murraya gleinei* root	511	V. Kumar, J. Reisch, D. B. M. Wickremaratne, R. A. Hussain, K. S. Adesina and S. Balasubramaniam
Galloylarbutin and other polyphenols from *Bergenia purpurascens*	515	C. Xin-Min, T. Yoshida, T. Hatano, M. Fukushima and T. Okuda
Minor aristolochic acids from *Aristolochia argentina* and mass spectral analysis of aristolochic acids	519	H. A. Priestap
Flavonoid analogues from *Pterocarpus* species	531	B. C. B. Bezuidenhoudt, E. V. Brandt and D. Ferreira
Kinabaline and the aporphinoid biogenesis of azaanthracene and azafluorene alkaloids	537	D. Tadić, B. K. Cassels, M. Leboeuf and A. Cavé
Isolation and structural studies on the alkaloids of *Petchia ceylanica*	543	Atta-ur-Rahman, W. S. J. Silva, K. A. Alvi and K. T. De Silva
The protoberberine alkaloids of *Stephania suberosa*	547	A. Patra, C. T. Montgomery, A. J. Freyer, H. Guinaudeau, M. Shamma, B. Tantisewie and K. Pharadai
An evaluation of the tautomerism of cinchoninone and quinidinone made using a combination of ^{1}H NMR and ^{13}C NMR spectroscopy	551	R. J. Robins and M. J. C. Rhodes
The structure of isostrychnopentamine, a bisindole monoterpene alkaloid from *Strychnos usambarensis*	557	D. Tavernier, W. Zhang, L. Angenot, M. Chierici-Tits and J. Leclercq
Absolute structure of gibboside, an iridoid glucoside from *Patrinia gibbosa*	561	S. Uesato, X. Shan, H. Inouye, T. Shingu, M. Inoue and M. Doi
Short Reports		
A chlorohydrin amino acid from *Amanita abrupta*	565	T. Ohta, S. Nakajima, S.-I. Hatanaka, M. Yamamoto, Y. Shimmen, S. Nishimura, Z. Yamaizumi and S. Nozoe
Failure to detect glucosinolates in cocoa	567	B. Bjerg, G. R. Fenwick, A. Spinks and H. Sørensen
Eudesmane derivatives from *Epaltes divericata*	569	S. R. Rojatkar, V. G. Puranik, S. S. Tavale, T. N. Guru Row and B. A. Nagasampagi
A valencane sesquiterpenoid from *Teucrium carolipaui*	571	G. Savona, F. Piozzi, M. C. de la Torre, O. Servettaz and B. Rodríguez
Pedonin, a spiro tetranortriterpenoid insect antifeedant from *Harrisonia abyssinica*	573	A. Hassanali, M. D. Bentley, A. M. Z. Slawin, D. J. Williams, R. N. Shephard and A. W. Chapya
24-Methylene-25-methyllathosterol; a sterol from *Sicyos angulatus*	575	T. Akihisa, T. Tamura and T. Matsumoto
A naphthoquinone from *Helicteres angustifolia*	578	M. Wang and W. Liu
Prenylated phthalides from *Anaphalis araneosa* and *Helichrysum platypterum*	580	J. Jakupovic, A. Schuster, H. Sun, F. Bohlmann and D. S. Bhakuni
Jatropham glucoside from the bulbs of *Lilium hansonii*	582	H. Shimomura, Y. Sashida, Y. Mimaki and Y. Minegishi

Thalifaboramine, a dimeric aporphinoid alkaloid from *Thalictrum faberi* 583 L.-Z. Lin, S.-F. Li and H. Wagner

Andrachcine, an alkaloid from *Andrachne aspera* 585 V. U. Ahmad and M. A. Nasir

Echinozolinone, an alkaloid from *Echinops echinatus* 587 P. K. Chaudhuri

Strictanol and strictanine—two new indole alkaloids from the fruits of *Rhazya stricta* 589 Atta-ur-Rahman and S. Malik

Book Reviews

Photosynthesis Energy Transduction; a Practical Approach: edited by M. F. Hipkins and N. R. Baker 593 C. Foyer

Hormonal Regulation of Development III. Role of Environmental Factors: edited by R. P. Pharis and D. M. Reid 593 J. D. Ross

Number 3

Announcements 595

Review Article Number 23

Role and regulation of L-glutamate dehydrogenase activity in higher plants 597 H. S. Srivastava and R. P. Singh

Growth and Metabolism

Inorganic phosphate mimics the specific action of gibberellic acid in regulating the activity of monophenolase in embryo-less half-seeds of wheat 611 D. Saluja, M. Berry and R. C. Sachar

A soluble protein factor from Chinese cabbage converts indole-3-acetaldoxime in IAA 615 J. Helmlinger, T. Rausch and W. Hilgenberg

The green algal pigment caulerpin as a plant growth regulator 619 M. F. Raub, J. H. Cardellina II and J. G. Schwede

Lipid hydroperoxides in the conversion of 1-aminocyclopropane-1-carboxylic acid to ethylene 621 H. W. Gardner and J. W. Newton

In vitro proteolytic processing of pea and jack bean storage proteins by an endopeptidase from lupin seeds 627 M. Duranti, J. A. Gatehouse, D. Boulter and P. Cerletti

Chemical modification and amino terminal sequence of calotropin DI from *Calotropis gigantea* 633 D. Bhattacharya, A. Sengupta and N. K. Sinha

Hydrogenase from the unicellular cyanobacterium, *Microcystis aeruginosa* 637 Y. Asada, S. Kawamura and K.-K. Ho

Purification and characterization of diamine oxidase from clover leaves 641 E. Delhaize and J. Webb

The role of inorganic phosphate in the regulation of PFK activity in tomatoes 645 J. E. Isaac and M. J. C. Rhodes

Phosphofructokinase and ripening in *Lycopersicon esculentum* fruits 649 J. E. Isaac and M. J. C. Rhodes

Acid phosphatases from latices of Euphorbiaceae 655 K. R. Lynn and N. A. Clevette-Radford

An affinity matrix for the isolation of L-phenylalanine ammonia-lyase 659 R. A. Dixon, G. P. Bolwell, R. L. Sunley, D. K. Lawrence and I. G. Bridges

Inhibition of sterol $\Delta^8 \rightarrow \Delta^7$-isomerase and Δ^{14}-reductase by fenpropimorph tridemorph and fenpropidin in cell-free enzyme systems from *Saccharomyces cerevisiae* 663 R. I. Baloch and E. I. Mercer

Degradation of 2-hydroxybut-3-enylglucosinolate (progoitrin) 669 A. J. MacLeod and J. T. Rossiter

Influence of herbicides and growth regulators on the growth and essential oil content of sage — 675 N. E. El-Keltawi and R. Croteau

Biochemical changes involved in stress response and ripening behaviour of γ-irradiated mango fruit — 681 L. Frylinck, I. A. Dubery and J. C. Schabort

Ecological Biochemistry

Synthesis and biological activity of mimics of PM-toxins, the host-specific corn pathotoxin produced by *Phyllosticta maydis* — 687 Y. Suzuki, L. W. Coleman, J. M. Daly, Y. Kono, H. W. Knoche and S. Takeuchi

Biologically active saponins from *Dodonaea viscosa* — 697 H. Wagner, C. Ludwig, L. Grotjahn and M. S. Y. Khan

Identity of the phytotoxin stemphylin from *Stemphylium botryosum* with altersolanol A — 703 G. Assante and G. Nasini

Effect of drought and wounding stress on indole alkaloid formation in *Catharanthus roseus* — 707 P. M. Frischknecht, M. Bättig and T. W. Baumann

Cell Culture and Biotechnology

Wall-bound α-glucosidase of suspension-cultured rice cells — 711 Y. Yamasaki and H. Konno

Triterpenoids from *Eucalyptus perriniana* cultured cells — 715 T. Furuya, Y. Orihara and C. Hayashi

Tryptophan decarboxylase, strictosidine synthase and alkaloid production by *Cinchona ledgeriana* suspension cultures — 721 S. E. Skinner, N. J. Walton, R. J. Robins and M. J. C. Rhodes

Chemotaxonomy

The characterization of esulone C and chemotaxonomy of jatrophane diterpenes in leafy spurge — 727 G. D. Manners and D. G. Davis

Dominance of Δ^5-sterols in eight species of the Cactaceae — 731 T. A. Salt, J. E. Tocker and J. H. Adler

Long chain alkyl phenols from the liverwort *Schistochila appendiculata* — 735 Y. Asakawa, T. Masuya, M. Tori and E. O. Campbell

High levels of phenolic compounds in *Prochloron* species — 739 W. R. Barclay, J. M. Kennish V. M. Goodrich and R. Fall

Plant Chemistry

Oxygenated fatty acids from *Lemna trisulca* — 745 P. Monaco and L. Previtera

Long chain esters of *Virola* species — 749 K. Kawanishi and Y. Hashimoto

Iridoid glycosides from *Penstemon richardsonii* — 753 B. Gering, P. Junior and M. Wichtl

Schkuhridin A and schkuhridin B, *C*-14β,*H*-5α-elemanolides from *Schkuhria schkuhrioides* — 755 G. Delgado, S. Guzmán and A. R. de Vivar

Ambrosanolides from *Parthenium lozanianum* — 761 J. Jakupovic, V. P. Pathak, F. Bohlmann and X. A. Dominguez

Absinthifolide, a sesquiterpene glycoside from *Bahia absinthifolia* var. *absinthifolia* — 765 A. L. Pérez C., L. Nava M. and A. R. de Vivar

Diterpene resin acids from the needle oleoresin of *Pinus strobus* — 769 D. F. Zinkel and T. V. Magee

Diterpenes from *Sideritis dendrochahorra* and *S. cystosiphon* — 775 B. M. Fraga, M. G. Hernández, C. Fernández and J. M. Arteaga

Diterpenoids and a sesquiterpene lactone from *Viguiera ladibractate* — 779 F. Gao, H. Wang and T. J. Mabry

Triterpenes from the leaves of *Parsonsia laevigata* — 783 K. Ogihara, M. Higa, K. Hokama and T. Suga

Structure of two antiviral triterpene saponins from *Anagallis arvensis* — 787 M. Amoros and R. L. Girre

Hirsudiol, a triterpenoid from *Cocculus hirsutus*	793	V. U. Ahmad, F. V. Mohammad and T. Rasheed
Naphthoquinones and derivatives from *Fusarium*	795	J. H. Tatum, R. A. Baker and R. E. Berry
Distichol, an antibacterial polyphenol from *Shorea disticha*	799	M. U. S. Sultanbawa, S. Surendrakumar and P. Bladon
Obliquin derivatives and other constituents from Australian *Helichrysum* species	803	J. Jakupovic, V. P. Pathak, F. Bohlmann, R. M. King and H. Robinson
A chromene, an isoprenylated methyl hydroxybenzoate and a *C*-methyl flavanone from the bark of *Piper hostmannianum*	809	P. P. Díaz D., T. Arias C. and P. Joseph-Nathan
Configuration and conformation of dihydroflavonols from *Acacia melanoxylon*	813	L. Y. Foo
Tropane alkaloids from *Schizanthus grahamii*	819	A. San-Martín, C. Labbé, O. Muñóz, M. Castillo, M. Reina, G. de la Fuente and A. González
Phosphatidylpyrrolophenanthridine alkaloids from *Zephyranthes flava*	823	S. Ghosal, S. K. Singh and S. G. Unnikrishnan
Bisbenzylisoquinoline alkaloids from *Cocculus pendulus*	829	H. Guinaudeau, M. Bashir, M. D. Colton, A. J. Freyer, M. Shamma, K. Jehan, A. Nilofar and Atta-ur-Rahman
Quaternary alkaloids from *Peschiera fuchsiaefolia*	833	R. M. Braga and F. de A. M. Reis
Short Reports		
Amino acid composition of gum exudates from some African *Combretum*, *Terminalia* and *Anogeissus* species	837	D. M. W. Anderson, J. F. Howlett and C. G. A. McNab
O-Acetylethanolamine, a natural product from the Leguminosae	839	A. R. Hayman and D. O. Gray
Lipids from roots of *Onosma heterophylla*	842	A. S. Mellidis and V. P. Papageorgiou
Phenolic glycerides from *Lilium auratum*	844	H. Shimomura, Y. Sashida and Y. Mimaki
Composition of essential oils from Turkish *Salvia* species	846	A. Bayrak and A. Akgül
Sesquiterpene lactones from *Calea septuplinervia*	848	A. G. Ober and N. H. Fischer
A 3,4-*seco*-ambrosanolide from *Ambrosia artemisiifolia*	850	M. Stefanović, I. Aljančić-Šolaja and S. Milosavljević
Terpenoids from *Calocedrus formosana*	853	J.-M. Fang, S.-T. Jan and Y.-S. Cheng
3-*O*-malonylbetulafolientriol oxide I from *Betula nana* subsp. *exilis*	855	P. B. Reichardt, T. P. Green and S. Chang
Sitosterol 3-*O*-α-D-xyluronofuranoside from *Bauhinia candicans*	857	A. M. Iribarren and A. B. Pomilio
Luteolin 6-*C*-β-ristobioside from *Poa annua*	859	R. D. Rofi and A. B. Pomilio
Flavonol glycosides from *Epimedium sagittatum*	861	M. Mizuno, S. Hanioka, N. Suzuki, M. Iinuma, T. Tanaka, L. Xin-shun and M. Zhi-da

Pyrrole-3-carbamidine: a lethal principle from *Nierembergia hippomanica* 863 C. A. Buschi and A. B. Pomilio

N_b-Demethylalstophylline oxindole, an oxindole alkaloid from the leaves of *Alstonia macrophylla* 865 Atta-ur-Rahman, W. S. J. Silva, K. A. Alvi and K. T. D. De Silva

Alkaloids of *Alstonia macrophylla* 868 C. K. Ratnayake, L. S. R. Arambewela, K. T. D. De Silva, Atta-ur-Rahman and K. A. Alvi

Baiyumine-A and -B, two acridone alkaloids from *Citrus grandis* 871 T. S. Wu

Alkaloids and coumarins of *Skimmia reevesiana* 873 T. S. Wu

Ajmalicidine, an alkaloid from *Rauwolfia serpentina* 875 S. Siddiqui, S. S. Ahmad, S. I. Haider and B. S. Siddiqui

Tomatine, its effect, and interaction with abscisic acid on stomatal opening in *Commelina communis* 877 S. S. Sharma, S. Sharma and V. K. Rai

Book Reviews

Chemistry of Plant Protection. 1. Sterol Biosynthesis, Inhibitors and Anti-feeding Compounds: edited by G. Hang and H. Hoffmann 879 J. B. Harborne

Advances in Botanical Research, Vol. 12: edited by J. A. Callow 879 J. B. Harborne

Number 4

Growth and Metabolism

Effect of lead and mercury on chlorophyll synthesis in mung bean seedlings 881 D. D. K. Prasad and A. R. K. Prasad

Growth and production of cell constituents in batch cultures of *Botryococcus sudeticus* 885 R. Vazquez-Duhalt and H. Greppin

Influence of foliar applied cytokinins on growth and essential oil content of several members of the Lamiaceae 891 N. E. El-Keltawi and R. Croteau

Arachin polymorphism in groundnut (*Arachis hypogaea* L.) 897 T. G. Krishna and R. Mitra

Subunit structure and immunological properties of a basic 7S globulin from soybean seeds 903 K. Sato, T. Yamagishi, Y. Kamata and F. Yamauchi

Related glycoprotein lectins from root stocks of wild cucumbers 909 W. J. Peumans, A. K. Allen, M. Nsimba-Lubaki and M. J. Chrispeels

Activation of an NADPH oxidase from maize by dipicolinic acid 913 V. V. S. Tyagi, R. R. Henke and W. R. Farkas

L-Mimosine, a slow-binding inhibitor of mushroom tyrosinase 917 J. Cabanes, F. García-Cánovas, J. Tudela, J. A. Lozano and F. García-Carmona

Arabinosyl:hydroxyproline transferase activity in *Chlamydomonas reinhardtii* 921 L. F. McLaughlin, D. H. Northcote and K. Roberts

α- and β-Galactosidase activities in protein bodies and cell walls of lentil seed cotyledons 927 M. P. Corchete and H. Guerra

Partial purification and characterization of a luteolin-triglucuronide-specific β-glucuronidase from rye primary leaves (*Secale cereale*) 933 M. Schulz and G. Weissenböck

Biochemical properties of latices from the Euphorbiaceae 939 K. R. Lynn and N. A. Clevette-Radford

Homogeneous alkylcysteine lyase of *Acacia farnesiana*: fresh seedlings vs. acetone powders — 945 W. J. Sweet and M. Mazelis

Soluble-starch-synthesizing and sucrose-degrading enzymes in *Onoclea* spores — 949 D. H. Wiebe, L. R. Towill and C. Campbell-Domsky

Reduction of linolenate content in soybean cotyledons by a substituted pyridazinone — 955 X.-M. Wang, D. F. Hildebrand, H. D. Norman, M. L. Dahmer, J. B. St. John and G. B. Collins

The influence of carotenoids on the oxidative stability and phase behaviour of plant polar lipids — 961 M. A. Brown and J. K. Raison

Ecological Biochemistry

Alcohol dehydrogenase gene expression in callus and somatic embryo of carrot — 967 S. Ramagopal and Z. R. Sung

Paxilline biosynthesis by *Acremonium loliae*; a step towards defining the origin of lolitrem neurotoxins — 969 C. M. Weedon and P. G. Mantle

Release of elemental mercury by intact Hawaiian *Metrosideros*: first *in situ* measurements — 973 C. Barghigiani, B. Z. Siegel and S. M. Siegel

A possible relationship between phytoalexin production in the cotton leaf and a phytotoxic response — 975 H. J. Zeringue, Jr.

Stypandrone: a toxic naphthalene-1,4-quinone from *Stypandra imbricata* and *Dianella revoluta* — 979 S. M. Colegate, P. R. Dorling and C. R. Huxtable

Phenolic glycosides from diseased roots of *Rehmannia glutinosa* var. *purpurea* — 983 Y. Shoyama, M. Matsumoto and I. Nishioka

Biosynthesis

The synthesis of tritiated ribosylzeatin with high specific activity — 987 M. Laloue and J. E. Fox

Genetic control of hydroxycinnamoyl-coenzyme A: anthocyanidin 3-glycoside-hydroxycinnamoyltransferase from petals of *Matthiola incana* — 991 M. Teusch, G. Forkmann and W. Seyffert

Cell Culture and Biotechnology

Biotransformation of monoterpenoids by suspension cultures of *Lavandula angustifolia* — 995 G. J. Lappin, J. D. Stride and J. Tampion

Production of quassinoids by tissue cultures of *Ailanthus altissima* — 999 M. Jaziri, J. Homes and M. Vanhaelen

Enantioselective hydrolysis of esters and the oxidation of aromatic-aliphatic alcohols obtained therefrom by *Spirodela oligorrhiza* — 1001 P. Pawłowicz and A. Siewiński

Bisbenzylisoquinoline alkaloids in *Berberis* cell cultures — 1005 B. K. Cassels, E. Breitmaier and M. H. Zenk

Chemotaxonomy

Erythro- and lymphoagglutinins of *Phaseolus acutifolius* — 1009 A. Pusztai, W. B. Watt and J. C. Stewart

Fatty acids of seeds of North American pedicillate *Trillium* species — 1015 V. G. Soukup and R. T. Holman

Sesqui- and diterpenoids from the liverworts *Porella densifolia* subsp. *appendiculata* and *Porella densifolia* var. *fallax* — 1019 Y. Asakawa, K. Takikawa, M. Toyota, A. Ueda, M. Tori and S. S. Kumar

Bibenzyl derivatives from the Australian liverwort *Frullania falciloba* — 1023 Y. Asakawa, K. Takikawa and M. Tori

Rare 6- and 8-*O*-methylated epicuticular flavonols from two *Cistus* species — 1027 T. Vogt, P. Proksch, P.-G. Gülz and E. Wollenweber

Alkaloids and phenolics of *Wurmbea* and *Burchardia* species — 1031 H. Potěšilová, T. D. Macfarlane, D. Guénard and V. Šimánek

Plant Chemistry

Alkali-soluble polysaccharides from *Chaetangium fastigiatum*: structure of a xylan	1033	M. C. Matulewicz and A. S. Cerezo
(+)-7-Iso-jasmonic acid and related compounds from *Botryodiplodia theobromae*	1037	O. Miersch, A. Preiss, G. Sembdner and K. Schreiber
Epicuticular waxes of *Abies balsamea* and *Picea glauca*: occurrence of long-chain methyl esters	1041	A. P. Tulloch
Lipid composition of *Azolla caroliniana* biomass and its seasonal variation	1045	C. Paoletti, F. Bocci, G. Lercker, P. Capella and R. Materassi
Sesquiterpene derivatives from *Othonna* and related species	1049	J. Jakupovic, V. P. Pathak, M. Grenz, S. Banerjee, C. Wolfrum, R. N. Baruah and F. Bohlmann
Chamigrane metabolites from a Jamaican variety of *Laurencia obtusa*	1053	M. R. Brennan, K. L. Erickson, D. A. Minott and K. O. Pascoe
Sesquiterpene lactones and a sesquiterpene diol from Jamaican *Ambrosia peruviana*	1059	G. Goldsby and B. A. Burke
Structure and absolute stereochemistry of tomenphantopin-A and -B, two cytotoxic sesquiterpene lactones from *Elephantopus tomentosus*	1065	T. Hayashi, J. Koyama, A. T. McPhail and K.-H. Lee
Further guaianolides and 5-alkylcoumarins from *Gutenbergia* and *Bothriocline* species	1069	J. Jakupovic, R. Boeker, A. Schuster, F. Bohlmann and S. B. Jones
Diterpenoids from *Halimium viscosum*	1077	J. G. Urones, J. de P. Teresa I. S. Marcos, D. D. Martín, N. M. Garrido and R. A. Guerra
Dilophic acid, a diterpenoid from the tropical brown seaweed *Dilophus guineensis*	1081	D. Schlenk and W. H. Gerwick
Diterpenoids with a novel skeleton from the liverwort *Anastrophyllum minutum*	1085	J. Beyer, H. Becker, M. Toyota and Y. Asakawa
Terpenoids from *Salvia lanigera*	1091	H. M. G. Al-Hazimi, G. A. Miana and M. S. H. Deep
Triterpenes from the seed of *Abies firma*	1095	S. Hasegawa, N. Kaneko and Y. Hirose
Triterpene glycosides related to quadranguloside from *Passiflora quadrangularis*	1101	F. Orsini, F. Pelizzoni, G. Ricca and L. Verotta
Pentacyclic triterpenoids from *Prunella vulgaris*	1107	H. Kojima, H. Tominaga, S. Sato and H. Ogura
Acetophenones and terpenoids from *Senecio gallicus*	1113	J. G. Urones, J. de P. Teresa, I. S. Marcos, R. F. Moro, P. B. Barcala and M. J. S. Cuadrado
Bibenzyl derivatives from *Frullania* species	1117	Y. Asakawa, R. Matsuda and A. Cheminat
Two substituted bibenzyls and a dihydrophenanthrene from *Cymbidium aloifolium*	1123	R. K. Juneja, S. C. Sharma and J. S. Tandon
Confusarin and confusaridin, two phenanthrene derivatives of the orchid *Eria confusa*	1127	P. L. Majumder and A. Kar
ψ-Esters of depsidones with a lactole ring	1131	S. Huneck and R. Tabacchi
Pyranocoumarins from *Arracacia nelsonii*	1139	G. Delgado and J. Garduño

A dihydrocinnamoyl neoflavanoid from *Pityrogramma calomelanos*	1143	D. M. X. Donnelly, N. Fukuda, E. Wollenweber, J. Polonsky and T. Prangé
Phenolic glucoside gallates from *Quercus mongolica* and *Q. acutissima*	1147	K. Ishimaru, G. Nonaka and I. Nishioka
Cleistanthoside B, a diphyllin glycoside from *Cleistanthus patulus* heartwood	1153	K. V. Sastry, E. V. Rao J. G. Buchanan and R. J. Sturgeon
Neolignans from stem bark of *Ocotea veraguensis*	1155	M. R. Khan, A. I. Gray and P. G. Waterman
Lignans, neolignans and norneolignans from *Krameria cystisoides*	1159	H. Achenbach, J. Groß, X. A. Dominguez, G. Cano, J. V. Star, L. del C. Brussolo, G. Muñoz, F. Salgado and L. López
Flavan-3-ol and procyanidin glycosides from *Quercus miyagii*	1167	K. Ishimaru, G. Nonaka and I. Nishioka
A biflavone from *Ochna pumila*	1171	M. Kamil, N. A. Khan, M. S. Alam and M. Ilyas
Flavonoids, inositol esters and pantolactone homologues from *Marshallia tenuifolia*	1175	W. Herz and M. Bruno
Quercetin and patuletin 3,3′-disulphates from *Flaveria chloraefolia*	1181	D. Barron and R. K. Ibrahim
Acetylated allose-containing flavonoid glucosides from *Stachys anisochila*	1185	A. Lenherr and T. J. Mabry
Unusual flavonoids from *Lonchocarpus orotinus* seeds	1189	P. G. Waterman and E.-H. N. Mahmoud
Short Reports		
Caffeoyltryptophan from green robusta coffee beans	1195	H. Morishita, Y. Takai, H. Yamada, F. Fukuda, M. Sawada, H. Iwahashi and R. Kido
Structural features of an arabinogalactan from the seeds of *Becium filamentosum*	1197	M. R. Khan, P. V. Salimath, Y. V. Anjaneyalu and R. N. Tharanathan
Two acetylenic compounds from *Echinacea pallida* roots	1198	R. Bauer, I. A. Khan, V. Wray and H. Wagner
(7*R*)-*trans*,*trans*-Nepetalactone from *Nepeta elliptica*	1200	A. T. Bottini, V. Dev, D. J. Garfagnoli, H. Lohani, C. S. Mathela and A. K. Pant
(−)-Epingaione from *Bontia daphnoides*	1202	R. J. Chinnock, E. L. Ghisalberti and P. R. Jefferies
Sesquiterpene lactones from *Calea megacephala*	1204	A. G. Ober, L. E. Urbatsch and N. H. Fischer
Sesquiterpene lactones from *Bedfordia arborescens*	1207	C. Zdero, F. Bohlmann, R. M. King and H. Robinson
Guaianolide from *Saussurea lappa*	1209	R. S. Dhillon, P. S. Kalsi, W. P. Singh, V. K. Gautam and B. R. Chhabra
18-Oxoferruginol from the leaf of *Torreya nucifera*	1211	L. J. Harrison and Y. Asakawa
Triterpenoids of *Amsonia grandiflora*	1213	S. Wahyuono, J. J. Hoffmann, S. D. Jolad and S. J. Dentali
Soyasaponin IV, an additional monodesmosidic saponin isolated from soyabean	1214	J. C. Burrows, K. R. Price and G. R. Fenwick

Photochemical decomposition of cannabidiol in its resin base	1216	J. Lydon and A. H. Teramura
Two flavanones from the root bark of *Lespedeza davidii*	1218	M. Wang, J. Li and W. Liu
Anthocyanins in fruits of *Vaccinium japonicum*	1220	Ø. M. Andersen
Flavonol glycosides from *Callitris glauca*	1221	I. U. Khan and W. H. Ansari
Sesquiterpene acids from *Inula viscosa*	1223	A. Ulubelen, S. Öksüz and N. Gören
A flavonol glycoside from *Lysimachia mauritiana*	1224	K. Yasukawa and M. Takido
Three bis-dehydroaporphines from *Oxandra* cf. *major*	1227	G. Arango, D. Cortes and A. Cavé
Sativanine-K: an additional *N*-formyl cyclopeptide alkaloid from *Zizyphus sativa*	1230	A. H. Shah, M. A. Al-Yahya, S. Devi and V. B. Pandey
Fumadensine, a phthalideisoquinoline from *Fumaria densiflora*	1233	M. H. A. Zarga, S. S. Sabri, S. Firdous and M. Shamma
Book Reviews		
Progress in Essential Oil Research: edited by E.-J. Brunke	1235	B. V. Charlwood
Cell Components: edited by H. F. Liskins and J. F. Jackson	1235	J. L. Hall
The Biochemistry of Energy Utilization in Plants: by D. T. Dennis: Tertiary Level Biology	1236	E. G. Brown

Number 5

Review Article Number 24		
Enzymology and compartmentation of polymethylated flavonol glucosides in *Chrysosplenium americanum*	1237	R. K. Ibrahim, V. De Luca, H. Khouri, L. Latchinian, L. Brisson and P. M. Charest
Growth and Metabolism		
Occurrence and metabolism of 7-hydroxy-2-indolinone-3-acetic acid in *Zea mays*	1247	P. Lewer and R. S. Bandurski
ELISA determination of IAA using antibodies against ring-linked IAA	1251	V. C. Pence and J. L. Caruso
Recognition of phytotropins by the receptor for 1-*N*-naphthylphthalamic acid	1257	G. F. Katekar, A. E. Geissler, C. H. L. Kennard and G. Smith
Occurrence and metabolism of 1′,4′-*trans*-diol of abscisic acid	1269	M. Okamoto, N. Hirai and K. Koshimizu
Effects of lipoxygenase inhibitors on the formation of volatile compounds in wheat	1273	T. R. Hamilton-Kemp, R. A. Andersen, D. F. Hildebrand, J. H. Loughrin and P. D. Fleming
Metabolism of D,L-chloro-phenylalanines by phenylalanine aminotransferase isozymes purified from bushbean shoots	1279	D. C. Taylor and F. Wightman
Activation of nitrate reductase by calcium and calmodulin	1289	P. V. Sane, N. Kumar, M. Baijal, K. K. Singh and V. K. Kochhar
Induction of acid phosphatase in cotton seedlings: enzyme purification, subunit structure and kinetic properties	1293	R. Bhargava and R. C. Sachar
Mechanism of action of α-galactosidase	1299	C. D. Mathew and K. Balasubramaniam
Properties of a multifunctional 3′,5′-cyclic nucleotide phosphodiesterase from *Lactuca* cotyledons: comparison with mammalian enzymes capable of hydrolysing pyrimidine cyclic nucleotides	1301	D. Chiatante, R. P. Newton and E. G. Brown

Fatty acid content and composition in relation to grain size of barley	1307	W. De Man and P. Bruyneel
Incorporation of [1-^{14}C]acetate into the fatty acyl groups of soybean root plasma membrane phospholipids	1311	C. E. Whitman and R. L. Travis
Identification of siderophores and siderophore-mediated uptake of iron in *Stemphylium botryosum*	1317	S. Manulis, Y. Kashman and I. Barash
Guaiacol and isovanillic acid as metabolites in the transformation of methoxyphenolic acids by *Nocardia autotrophica*	1321	E. Malarczyk, I. Korszeń-Pilecka, J. Rogalski and A. Leonowicz
Synergistic interaction between the potato glycoalkaloids α-solanine and α-chaconine in relation to lysis of phospholipid/sterol liposomes	1325	J. G. Roddick and A. L. Rijnenberg
Ecological Biochemistry		
Effects of sodium chloride stress on phosphoenolpyruvate carboxylase, NADP-malic enzyme and ribulose-1,5-bisphosphate carboxylase in shoots of Pearl millet	1329	S. Bouraima, J. Vidal, D. Lavergne, A. Hoarau and M.-L. Champigny
Salinity depression of growth and essential oil formation in spearmint and marjoram and its reversal by foliar applied cytokinin	1333	N. E. El-Keltawi and R. Croteau
A mitogenic agglutinin from the red alga *Carpopeltis flabellata*	1335	K. Hori, H. Matsuda, K. Miyazawa and K. Ito
Polysaccharides leached from the surface of pea endocarp	1339	M. M. Smith, A. Bacic and I. A. M. Cruickshank
The effect of mercury and cadmium on the fatty acid and sterol composition of the marine diatom *Asterionella glacialis*	1343	G. J. Jones, P. D. Nichols, R. B. Johns and J. D. Smith
Tryptophol, a phytotoxin produced by *Drechslera nodulosum*	1349	F. Sugawara and G. A. Strobel
Minor metabolites of *Monocillium nordinii*	1353	W. A. Ayer and L. Peña-Rodriguez
Changes in cotton leaf chemistry induced by volatile elicitors	1357	H. J. Zeringue Jr
Volatile constituents of balsam poplar: the phenol glycoside connection	1361	B. R. Mattes, T. P. Clausen and P. B. Reichardt
cis-9,10-Dihydrocapsenone: a possible catabolite of capsidiol from cell suspension cultures of *Capsicum annuum*	1367	I. M. Whitehead, D. R. Threlfall and D. F. Ewing
Sweet and bitter cucurbitane glycosides from *Hemsleya carnosiflora*	1371	R. Kasai, K. Matsumoto, R.-L. Nie, T. Morita, A. Awazu, J. Zhou and O. Tanaka
Lignans with platelet activating factor antagonist activity from *Magnolia biondii*	1377	J.-X. Pan, O. D. Hensens, D. L. Zink, M. N. Chang and S.-B. Hwang
A new form of antibiosis in *Nicotiana*	1381	J. E. Huesing and D. Jones
Isolation and characterization of allelochemicals in rye herbage	1385	J. P. Barnes, A. R. Putnam, B. A. Burke and A. J. Aasen
Biosynthesis		
1,5-D-Anhydrofructose, the precursor of the pyrone microthecin in *Morchella vulgaris*	1391	G. Deffieux, R. Baute, M.-A. Baute, A. Atfani and A. Carpy
Proposed pathway to the pyrones cortalcerone and microthecin in fungi	1395	R. Baute, M.-A. Baute and G. Deffieux
Biosynthesis of β-methylenenorvaline (2-amino-3-ethyl-3-butenoic acid) in *Philadelphus*	1399	D. H. G. Crout, I. M. Piper and C. K. Sehgal
Intracellular localization of tocopherol biosynthesis in *Calendula officinalis*	1403	W. Janiszowska

Biosynthesis of acerogenin A, a diarylheptanoid from *Acer nikoense* 1409 T. Inoue, N. Kenmochi, N. Furukawa and M. Fujita

Role of cinnamate in benzoate production in *Penicillium brevicompactum* 1413 I. M. Campbell, M. A. Gallo, C. A. Jones, P. R. LaSitis and L. M. Rosato

Cell Culture and Biotechnology

Conversion of coconut oil to methyl ketones by two *Aspergillus* species 1417 J. L. Kinderlerer

Effect of nutritional factors on cryptotanshinone and ferruginol production by cell suspension cultures of *Salvia miltiorrhiza* 1421 H. Miyasaka, M. Nasu, T. Yamamoto, Y. Shiomi, H. Ohno, Y. Endo and K. Yoneda

Steroidal constituents of *Yucca shidigera* plants and tissue cultures 1425 N. Kaneda, H. Nakanishi and E. J. Staba

Redirecting cellular metabolism by immobilization of cultured plant cells: a model study with *Coffea arabica* 1431 D. Haldimann and P. Brodelius

Chemotaxonomy

The isolation and amino acid sequence of the β- and γ-subunits of the lectin from the seeds of *Dioclea grandiflora* 1435 I. L. Ainouz, R. A. Moreira, F. D. A. P. Campos, M. Richardson, R. Begbie, J. C. Stewart, W. B. Watt and A. Pusztai

Fatty acids of some Cornaceae, Hydrangeaceae, Aquifoliaceae, Hamamelidaceae and Styracaceae 1441 B. Breuer, T. Stuhlfauth, H. Fock and H. Huber

Plant Chemistry

Glycoproteins from *Ulva lactuca* 1447 A. F. Abdel-Fattah and H. H. Sary

Iridoid glucosides as sources of cyclopentanoid 1,5-dialdehydes: conversion of aucubigenin to eucommial and eucommiol 1449 E. Davini, C. Iavarone and C. Trogolo

Iridoid and phenolic glycosides from *Harpagophytum procumbens* 1453 J. F. W. Burger E. V. Brandt and D. Ferreira

Longipinanes and a germacranolide carboxylic acid from *Stevia potrerensis* 1459 R. R. Gil, J. C. Oberti, V. E. Sosa and W. Herz

Germacranolides and an alkyl glucoside from *Tanacetum vulgare* 1463 A. Chandra, L. N. Misra and R. S. Thakur

Germacranolides from *Elephantopus* species 1467 J. Jakupovic, Y. Jia, C. Zdero, U. Warning, F. Bohlmann and S. B. Jones

Diterpenes from the flowers of *Salvia canariensis* 1471 A. G. González, C. M. Rodríguez and J. G. Luis

Clerodane diterpenoids from *Teucrium* and *Ajuga* plants 1475 F. Camps, J. Coll, O. Dargallo, J. Rius and C. Miravitlles

Diterpenoids from *Nepeta tuberosa* subsp. *reticulata* 1481 J. de P. Teresa, J. G. Urones, I. S. Marcos, J. F. Ferreras, A. M. L. Bertelloni and P. B. Barcala

Isolation and characterization of two saponins from *Fagonia indica* 1487 A. A. Ansari, L. Kenne and A. ur-Rahman

Apocarotenoids from *Cochlospermum tinctorium* 1491 B. Diallo and M. Vanhaelen

The constitution and absolute stereochemistry of persicaxanthin 1493 P. Molnár, J. Szabolcs and L. Radics

Synrotolide, an α-pyrone from *Syncolostemon rotundifolius* 1497 M. T. D. Coleman, R. B. English and D. E. A. Rivett

Gallic acid esters of *proto*-quercitol, quinic acid and (−)-shikimic acid from *Quercus mongolica* and *Q. myrsinaefolia* 1501 K. Ishimaru, G. Nonaka and I. Nishioka

Further evidence for the structure of vaticaffinol and a revision of its stereochemistry 1505 S. Sotheeswaran, M. N. C. Diyasena A. A. L. Gunatilaka, M. Bokel and W. Kraus

2,5-Diaryl-3,4-dimethyltetrahydrofuranoid lignans 1509 A. Urzúa, A. J. Freyer and M. Shamma

Lignans from *Machilus thunbergii* 1513 H. Shimomura, Y. Sashida and M. Oohara

Flavonoids of *Iphiona scabra* 1517 A. A. Ahmed and T. J. Mabry

Alkaloids from *Narcissus confusus* 1519 J. Bastida, F. Viladomat, J. M. Llabrés, C. Codina, M. Feliz and M. Rubiralta

Short Reports

Entadamine B, a second new sulphur-containing amide from *Entada phaseoloides* 1525 F. Ikegami, S. Ohmiya, N. Ruangrungsi S.-I. Sakai and I. Murakoshi

Olefinic and acetylenic butenolides from *Peucedanum alsaticum* 1527 F. Hadaček, H. Greger, M. Grenz and F. Bohlmann

(+)-Isobicyclogermacrenal from *Aristolochia manshuriensis* 1529 G. Rücker, R. Mayer, H. Wiedenfeld, B. S. Chung and A. Güllmann

Fulvere lactones from *Tanacetum annuum* 1531 A. F. Barrero, J. F. Sánchez, M. J. Zafra, A. Barrón and A. S. Feliciano

Abietane diterpenoids from the roots of *Salvia cryptantha* 1534 A. Ulubelen, G. Topcu and B. Terem

Malabaricane derivatives from *Pyrethrum santolinoides* 1536 J. Jakupovic, F. Eid, F. Bohlmann and S. El-Dahmy

Glut-5(10)-en-3-one from *Andrachne cordifolia* 1539 K. S. Mukherjee and P. Bhattacharjee

ent-Isolariciresinol in *Reseda suffruticosa* 1540 J. G. Urones, J. de P. Teresa, I. S. Marcos and D. D. Martín

The structure of macelignan from *Myristica fragrans* 1542 W. S. Woo, K. H. Shin, H. Wagner and H. Lotter

Photooxygenation of 2′,4,4′-trihydroxychalcone: identity with products from enzymic oxidation 1544 E. Wong

Dhurrin, (−)-catechin, flavonol glycosides and flavones from *Chamaebatia foliolosa* 1546 A. Nahrstedt, P. Proksch and E. E. Conn

Harmalidine, a β-carboline alkaloid from *Peganum harmala* 1548 S. Siddiqui, O. Y. Khan, B. S. Siddiqui and S. Faizi

Revised structures of the azafluorenone alkaloids from *Guatteria dielsiana* 1551 D. Tadić, B. K. Cassels, A. Cavé, M. O. F. Goulart and A. B. De Oliveira

Book Reviews

Plant Physiology—A Treatise, Vol. 9: Water and Solutes in Plants: edited by F. C. Steward, J. F. Sutcliffe and J. E. Dale 1553 A. M. Mayer

Nuclear Magnetic Resonance: Basic Principles: by Atta-ur-Rahman 1553 H. Booth

The Science of Allelopathy: edited by A. R. Putnam and C. S. Tang 1554 J. B. Harborne

Molecular and Physiological Aspects of Plant Peroxidases: edited by H. GREPPIN, C. PENEL and T. GASPAR 1554 J. B. HARBORNE

Economic and Medicinal Plant Research, Volume 1: edited by H. WAGNER, H. HIKINO and N. R. FARNSWORTH 1555 J. B. HARBORNE

Number 6

Review Article Number 25
Degradation of storage proteins in germinating seeds 1557 A. D. SHUTOV and I. A. VAINTRAUB

Growth and Metabolism
Mitosis inhibition by a *N*-(1,1-dimethylpropynyl) benzamide series 1567 G. MERLIN, F. NURIT, P. RAVANEL, J. BASTIDE, C. COSTE and M. TISSUT

Substrates and aromatic carboxylic acid inhibitors of grape phenol oxidases 1573 Y. Z. GUNATA, J.-C. SAPIS and M. MOUTOUNET

Purification and characterization of chlorogenic acid: chlorogenate caffeoyl transferase in sweet potato roots 1577 R. J. A. VILLEGAS, T. SHIMOKAWA, H. OKUYAMA and M. KOJIMA

Cysteine desulphydrase activity in higher plants: evidence for the action of L- and D-cysteine specific enzymes 1583 H. RENNENBERG, N. ARABATZIS and I. GRUNDEL

Ethanolamine incorporation into membranes of pea embryonic axes during germination 1591 L. DI NOLA and A. M. MAYER

Triglyceride and fatty acid compositions in the mesocarp of *Persea americana* during fruit development 1595 E. M. GAYDOU, Y. LOZANO and J. RATOVOHERY

Ecological Biochemistry
Secalonic acid A, a vivotoxin in pink root-infected onion 1599 J. C. STEFFENS and D. J. ROBESON

Floral fragrances in *Actaea*, using differential chromatograms to descern between floral and vegetative volatiles 1603 O. PELLMYR, G. BERGSTRÖM and I. GROTH

Interconversions of aglycone and host-selective toxin from *Helminthosporium sacchari* 1607 H. NAKAJIMA and R. P. SCHEFFER

Ferulenol and ω-hydroxyferulenol, toxic coumarins from *Ferula communis* var. *genuina* 1613 D. LAMNAOUER, B. BODO, M.-T. MARTIN and D. MOLHO

Flavonoid biocides: phytoalexin analogues from condensed tannins 1617 P. E. LAKS

Annoquinone-A, an antimicrobial and cytotoxic principle from *Annona montana* 1623 T.-S. WU, T.-T. JONG, H.-J. TIEN, C.-S. KUOH, H. FURUKAWA and K.-H. LEE

Biosynthesis
Effects of vanadium, nickel and sulphur dioxide on polar lipid biosynthesis in jack pine 1627 A. A. KHAN and S. S. MALHOTRA

2,7-Dimethyl-octa-2,4-dienedioic acid, a possible by-product of abscisic acid biosynthesis in the tomato 1631 R. S. T. LINFORTH, W. R. BOWMAN, D. A. GRIFFIN, P. HEDDEN, B. A. MARPLES and I. B. TAYLOR

Intracellular localization of metabolism of lupeol and its palmitate in *Calendula officinalis* flowers 1635 B. WIŁKOMIRSKI

Senecionine *N*-oxide, the primary product of pyrrolizidine alkaloid biosynthesis in root cultures of *Senecio vulgaris* 1639 T. HARTMANN and G. TOPPEL

Cell Culture and Biotechnology
Enzyme activities in cell-free extracts of shikonin-producing *Lithospermum erythrorhizon* cell suspension cultures 1645 L. HEIDE and M. TABATA

Geranylpyrophosphate: *p*-hydroxybenzoate geranyltransferase activity in extracts of *Lithospermum erythrorhizon* cell cultures 1651 L. HEIDE and M. TABATA

An inexpensive inorganic medium for the mass cultivation of freshwater microalgae 1657 P. POHL, M. KOHLHASE, S. KRAUTWURST and K.-H. BAASCH

Chemotaxonomy
Passicoriacin and epipassicoriacin: C-4 epimers of tetraphyllin B and epitetraphyllin B from *Passiflora coriacea* 1661 K. C. SPENCER and D. S. SEIGLER

Passisuberosin and epipassisuberosin: two cyclopentenoid cyanogenic glycosides from *Passiflora suberosa* 1665 K. C. Spencer and D. S. Seigler

Cyanogenesis in the genus *Zieria* 1669 T. M. Flynn and I. A. Southwell

Essential oil constituents of the genus *Zieria* 1673 T. M. Flynn and I. A. Southwell

Chemical variation within the genus *Zieria* 1687 I. A. Southwell and J. A. Armstrong

Sterols of the Cucurbitaceae 1693 T. Akihisa, N. Shimizu, P. Ghosh, S. Thakur, F. U. Rosenstein, T. Tamura and T. Matsumoto

Plant Chemistry

Two malyngamides from the Caribbean cyanobacterium *Lyngbya majuscula* 1701 W. H. Gerwick, S. Reyes and B. Alvarado

λ-Carrageenan in the gametophytes of *Chondrus crispus* 1705 G. de L. Bremond, M. Quillet and M. Bremond

Some structural features of a heteropolysaccharide from the leaves of the cactus *Pereskia aculeata* 1709 M.-R. Sierakowski, P. A. J. Gorin, F. Reicher and J. B. C. Corrêa

Tetraprenyltoluquinols from the brown alga *Cystoseira stricta* 1715 V. Amico, G. Oriente, P. Neri, M. Piattelli and C. Ruberto

Prenylated *O*-methyltoluquinols from *Cystoseira stricta* 1719 V. Amico, F. Cunsolo, M. Piattelli and G. Ruberto

Lipid polymers from the turf-forming moss *Dicranum elongatum* 1723 P. Karunen, L. Heikkilä and E. Kälviäinen

9-Hydroxy substituted iridoids from *Gelsemium sempervirens* 1725 S. R. Jensen, O. Kirk, B. J. Nielsen and R. Norrestam

Apiene esters from *Ferula haussknechtii* 1733 M. Miski, T. J. Mabry and Ö. Saya

Sulcatine, a norsesquiterpene from the fungus *Laurilia sulcata* 1739 A. Arnone, G. Nasini, G. Assante, H. J. Roeijmans and G. W. Van Eijk

Sesquiterpene lactones from *Carphochaete bigelovii* 1743 B. Meurer, F. C. Seaman and T. J. Mabry

Sesquiterpene lactones from *Stevia ovata* and crystal structure of 11,13-dehydroeriolin 1747 J. S. Calderón, L. Quijano F. Gómez-Garibay, D. M. Sanchez, T. Rios and F. R. Fronczek

Quadrangolide, a heliangolide from *Eupatorium quadrangularae* 1751 T. D. Hubert, A. L. Okunade and D. F. Wiemer

Sesquiterpene lactols from *Laserpitium halleri* 1755 G. Appendino, M. G. Valle and P. Gariboldi

Labdane derivatives, a bisnorditerpene and sesquiterpenes from *Rutidosis murchisonii* 1759 C. Zdero, F. Bohlmann, R. M. King and H. Robinson

Dehydroabietane diterpenoids from *Calceolaria ascendens* 1763 M. C. Chamy, M. Piovano, V. Gambaro, J. A. Garbarino and M. Nicoletti

Triterpenes from *Euphorbia broteri* 1767 J. de P. Teresa, J. G. Urones, I. S. Marcos, P. Basabe, Mª J. S. Cuadrado and R. F. Moro

Triterpenoids from the fungus *Ganoderma lucidum* 1777 T. Nishitoba, H. Sato and S. Sakamura

Arvensoside A and B, triterpenoid saponins from *Calendula arvensis* 1785 R. Chemli, A. Babadjahian R. Faure, K. Boukef, G. Balansard and E. Vidal

Gitogenin-3-*O*-β-D-laminaribioside from the aerial part of *Agave cantala* 1789 D. C. Jain

Trechonolide A, a new withanolide type from *Trechonaetes laciniata*	1791	D. Lavie, R. Bessalle, M. J. Pestchanker, H. E. Gottlieb, F. Frolow and O. S. Giordano
Withanolide Y, a withanolide from a hybrid of *Withania somnifera*	1797	R. Bessalle, D. Lavie and F. Frolow
Withaminimin, a withanolide from *Physalis minima*	1801	H. E. Gottlieb, M. Cojocaru, S. C. Sinha, M. Sahai, A. Bagchi, A. Ali and A. B. Ray
Three phenylpropanoid glycosides from *Mussatia*	1805	C. Jimenez, M. C. Villaverde R. Riguera, L. Castedo and F. R. Stermitz
Cyclic bis(bibenzyls) and related compounds from the liverworts *Marchantia polymorpha* and *Marchantia palmata*	1811	Y. Asakawa, M. Tori, K. Takikawa, H. G. Krishnamurty and S. K. Kar
Sesebrinic acid, a cinnamic acid derivative from *Seseli sibiricum*	1817	S. K. Banerjee, S. Mukhopadhyay, B. D. Gupta, K. Singh and S. Raj
Hermosillol, an 8,3′-neolignan from *Krameria sonorae*	1821	X. A. Dominguez, C. Rombold, J. V. Star, H. Achenbach and J. Groß
Proanthocyanidin dimers and polymers from *Quercus dentata*	1825	D. Sun, H. Wong and L. Y. Foo
Homoisoflavonoids from *Caesalpinia sappan*	1831	M. Namikoshi, H. Nakata and T. Saitoh
Short Reports		
Cyanogenesis in *Acacia sutherlandii*	1835	W. K. Swenson, J. E. Dunn and E. E. Conn
Niloticol, a phenolic glyceride and two phenolic aldehydes from the roots of *Tamarix nilotica*	1837	H. H. Barakat, M. A. M. Nawwar, J. Buddrus and M. Linscheid
Two iridoid glycosides from *Campsidium valdivianum*	1839	A. Bianco, P. Passacantilli, S. Santini, M. Nicoletti, J. A. Garbarino and V. Gambaro
An anomalous sesquiterpene from *Helichrysum davyi*	1841	J. Jakupovic, T. Teetz and F. Bohlmann
4′-Hydroxywogonin 7-neohesperidoside from *Garcinia andamanica*	1843	M. S. Alam, M. Kamil and M. Ilyas
Lilaline—a flavonoid alkaloid from *Lilium candidum*	1844	I. Mašterová, D. Uhrín and J. Tomko
An oxindole from the roots of *Capparis tomentosa*	1845	T. G. Dekker, T. G. Fourie E. Matthee and F. O. Snyckers
Loesenerine, an alkaloid from *Maytenus loeseneri*	1847	M. Díaz, A. Preiss and H. Ripperger
Book Review		
Ökologische Biochemie: by D. Schlee	1849	J. B. Harborne
Errata	1851	

Number 7

Announcements	**1853**	
Growth and Metabolism		
Biological activity of antheridic acid, an antheridiogen of *Anemia phyllitidis*	1855	K. Takeno, H. Yamane, K. Nohara, N. Takahashi, E. J. Corey, A. G. Myers and H. Schraudolf
Presence of essential histidine residues in NADP–malic enzyme from maize	1859	N. Jawali and A. S. Bhagwat

Malate dehydrogenase and isocitrate dehydrogenase in root nodules of *Trigonella*	1863	C. S. Nautiyal and V. V. Modi
Exopolygalacturnoase in tomato fruit	1867	R. Pressey
Polyuronide solubilization during ripening of normal and mutant tomato fruit	1871	G. B. Seymour, S. E. Harding, A. J. Taylor, G. E. Hobson and G. A. Tucker
Protein kinase in *Cicer* embryonic axes	1877	A. Bansal, D. Saluja and R. C. Sachar
Sucrose metabolism and accumulation in developing fruit of *Cucumis*	1883	A. A. Schaffer, B. Aloni and E. Fogelman
Galactomannan changes in developing *Gleditsia triacanthos* seeds	1889	I. Mallett, B. V. McCleary and N. K. Matheson
Comparative analysis of fatty acids in pollen and seed of rapeseed	1895	D. E. Evans, N. E. Rothnie, M. V. Palmer, D. G. Burke, J. P. Sang, R. B. Knox, E. G. Williams, E. P. Hilliard, and P. A. Salisbury
Autolysis of phospholipids in homogenates of various plant tissues	1899	R. A. Moreau
Inhibition of membrane damage due to phospholipase activity during fractionation of wheat aleurone tissue	1903	M. C. Wilkinson, C. A. Brearley, T. Galliard and D. L. Laidman
Methomyl analogues with increased biological activity towards F_1T maize mitochondria	1909	G. Aranda, P. Durlin and C. Gauvrit
5-Hydroxyferulic acid in *Zea mays* and *Hordeum vulgare* cell walls	1915	H. Ohashi, E. Yamamoto, N. G. Lewis and G. H. N. Towers
Ecological Biochemistry		
Distribution of gramine and hydroxamic acids in barley and wheat leaves	1917	V. H. Argandoña, G. E. Zuñiga and L. J. Corcuera
The elicitation of phytoalexins by Ca^{2+} and cyclic AMP in carrot cells	1919	F. Kurosaki, Y. Tsurusawa and A. Nishi
Biosynthesis		
Revision of the pathway of D-pinitol formation in leguminosae	1925	P. Dittrich and A. Brandl
Biosynthesis of artemisinin in *Artemisia annua*	1927	A. Akhila, R. S. Thakur and S. P. Popli
Transformation of *ent*-kaur-15-enes by *Gibberella fujikuroi*	1931	B. M. Fraga, M. G. Hernandez, M. D. Rodriguez, C. E. Diaz, P. Gonzalez and J. R. Hanson
Solubilization of carotenogenic enzymes of *Aphanocapsa*	1935	P. M. Bramley and G. Sandmann
Tyrosine aminotransferase: the entrypoint enzyme of the tyrosine-derived pathway in rosmarinic acid biosynthesis	1941	W. De-Eknamkul and B. E. Ellis
Cell Culture and Biotechnology		
Variability in tissue cultures of *Choisya ternata* originating from a single tree	1947	J. Creche, J. Guiller, F. Andreu, M. Gras, J.-C. Chenieux and M. Rideau
Effect of norleucine on the metabolism of tobacco cells in suspension cultures	1955	A. M. Mayer and N. Bar-Nun
Transformation of isoprenoids by orchids in tissue culture	1959	A. Mironowicz, K. Kukułczanka, K. Krasiński and A. Siewiński
Verbascoside production in callus and suspension cultures of *Hygrophila erecta*	1961	M. Henry, J.-L. Roussel and C. Andary
Chemotaxonomy		
K_m values of ribulose-1,5-bisphosphate carboxylase of cassava cultivars	1965	K. Paul and H.-H. Yeoh

Glucosinolates of wild and cultivated *Bassica* species	1969	R. F. Mithen, B. G. Lewis, R. K. Heaney and G. R. Fenwick
Quantifying intra-plant variation of volatile terpenoids in carrot	1975	D. Senalik and P. W. Simon
Iridoid glucosides and phenylpropanoid glycosides in *Ajuga* species of Japan	1981	H. Shimomura, Y. Sashida and K. Ogawa
Biflavones from the genus *Podocarpus*	1985	S. K. Roy, M. A. Qasim, M. Kamil and M. Ilyas
Plant Chemistry		
Structural analysis of a 4-*O*-methyl-glucuronoarabinoxylan with immuno-stimulating activity from *Echinacea purpurea*	1989	A. Proksch and H. Wagner
3-Oxo-α-ionol, vomifolioi and roseoside in *Vitis vinifera* fruit	1995	C. R. Strauss, B. Wilson and P. J. Williams
Germacranolides, guaianolides and eudesmanolides from *Greenmaniella resinosa*	1999	C. Zdero, F. Bohlmann and R. Scott
Guaiane sesquiterpene from *Lactarius sanguifluus*	2007	S. De Rosa and S. De Stefano
Millerenolides, sesquiterpene lactones from *Milleria quinqueflora*	2011	J. Jakupovic, V. Castro and F. Bohlmann
Diterpenes from *Salvia breviflora*	2019	G. Cuevas, O. Collera, F. García, J. Cárdenas, E. Maldonado and A. Ortega
A triterpene and saponin from roots of *Ilex pubescens*	2023	K. Hidaka, M. Ito, Y. Matsuda, H. Kohda, K. Yamasaki and J. Yamahara
Semi-β-carotenone from leaves of two cycads	2029	F. Cardini, M. Ginanneschi, A. Selva and M. Chelli
Lignans of *Piper cubeba*	2033	L. P. Badheka, B. R. Prabhu and N. B. Mulchandani
Neolignans from fruits of *Ocotea veraguensis*	2037	C. D. Dodson, F. R. Stermitz, O. Castro C. and D. H. Janzen
Ramosissin and other methoxylated nor-neolignans from *Krameria ramosissima*	2041	H. Achenbach, J. Groß, X. A. Dominguez, J. V. Star and F. Salgado
Xanthonolignoids from *Kielmeyera coriacea*	2045	M. M. de M. Pinto, A. A. L. Mesquita and O. R. Gottlieb
(+)-Catechin-galloyl esters from the bark of *Acacia gerrardii*	2049	E. Malan and D. H. Pienaar
Liquidambin, an ellagitannin from *Liquidambar formosana*	2053	T. Okuda, T. Hatano, T. Kaneda, M. Yoshizaki and T. Shingu
Phenylpropanoid glycosides isolated from *Scrophularia scopolii*	2057	I. Calis, G.-A. Gross and O. Sticher
Chromones and coumarins from *Skimmia laureola*	2063	T. K. Razdan, B. Qadri, S. Harkar and E. S. Waight
Phenolic constituents from seeds of *Coptis japonica* var. *dissecta*	2071	M. Mizuno, H. Kojima, T. Tanaka, M. Iinuma, R. Kimura, M. Zhi-da and H. Murata
Further polysubstituted flavones from *Ageratum houstonianum*	2075	L. Quijano, J. S. Calderón, F. G. Garibay, E. Escobar and T. Ríos
Four 6-hydroxyflavonols from *Blumea malcomii*	2079	M. M. Kulkarni, S. R. Rojatkar and B. A. Nagasampagi
6-Methoxyflavonol 3-monosulphates from *Flaveria chloraefolia*	2085	D. Barron and R. K. Ibrahim

Minor alkaloids of *Tylophora hirsuta* 2089 M. Ali and K. K. Bhutani

Azafluorenones from *Oxandra* cf. *major* and biogenetic considerations 2093 G. J. Arango, D. Cortes, B. K. Cassels, A. Cavé and C. Mérienne

Short Reports

A phenolic amide and other constituents of *Melandrium firmum* 2099 W. S. Woo and J. S. Choi

9-Octadecen-6-ynoic acid from *Riccia fluitans* 2101 G. Kohn, A. Vierengel, O. Vandekerkhove and É. Hartmann

Sesquiterpene lactones from *Artemisia maritima* 2103 V. P. Pathak and R. N. Khanna

Two caleines from *Calea zacatechichi* 2104 M. Martínez, B. Esquivel and A. Ortega

Kaurene derivatives from *Alepidea amatynsia* 2106 A. Rustaiyan and A. S. Sadjadi

Cordatin, a new diterpene from *Aparisthmium cordatum* 2108 H. Dadoun, A. H. Muller, M. Cesario, J. Guilhem and C. Pascard

C-12 stereochemistry of teupolin I and related diterpenoids from *Teucrium* species 2110 E. Gács-Baitz, G. Y. Papanov, P. Y. Malakov and L. Szilágyi

Lycopersiconolide, a steroid lactone from tomato roots 2113 T. Nagaoka, T. Yoshihara and S. Sakamura

Withaphysalin E, a withanolide of *Physalis minima* var. *Indica* 2115 S. C. Sinha, A. B. Ray, Y. Oshima, A. Bagchi and H. Hikino

Homoheveadride, a cyclononadiene bis-anhydride from *Cladonia polycarpoides* 2117 A. W. Archer and W. C. Taylor

4-Aminophyscion, an anthraquinone derivative from dermocybe (*Agaricales*) 2119 G. Keller and W. Steglich

Moscatilin, a bibenzyl derivative from the orchid *Dendrobium moscatum* 2121 P. L. Majumder and R. C. Sen

Spectral differentiation of 3,3′-di-*O*-methylellagic acid from 4,4′-di-*O*-methylellagic acid 2124 T. Satō

Two phenolic constituents from *Alpinia galanga* rhizomes 2126 B. R. Barik, A. B. Kundu and A. K. Dey

Flavonoid aglycones of *Holocarpha obconica* 2128 W. J. Crins and B. A. Bohm

Luteolin 7,4′-dimethyl ether 3′-glucoside from *Gelonium multiflorum* 2130 N. Parveen and N. U. Khan

Flavonoid aglycones from *Xathocephalum gymnospermoides* var. *gymnospermoides* 2131 S. Yu, N. Fang and T. J. Mabry

Sesquiterpene alkaloids from the celastraceae 2133 A. G. González, C. M. González, I. L. Bazzocchi, A. G. Ravelo, J. G. Luis and X. A. Domínguez

Bis-benzylisoquinoline alkaloids from *Abuta pahni* 2136 P. Duté, J.-F. Weber, A. Fournet, A. Cavé and J. Bruneton

Carbazole and 3-methylcarbazole from *Glycosmis pentaphylla* 2138 B. K. Chowdhury, A. Mustapha, M. Garba and P. Bhattacharyya

Indole alkaloids from *Alstonia scholaris* 2139 A.-ur-Rahman and K. A. Alvi

Book Reviews

The Alkaloids, Volume 27: edited by A. Brossi 2143 J. B. Harborne

Nutritional and Toxicological Significance of Enzyme Inhibitors in Foods, in Advances in Experimental Medicine and Biology, Vol. 199: edited by M. Friedman 2143 M. Richardson

Number 8

Growth and Metabolism

Conjugation of aspartic acid with 4-bromophenylacetic acid, an auxin analogue of aspartic acid — 2145 — G. Aranda, J. Muller and M. Caboche

Regulation of molybdenum cofactor of maize leaf — 2149 — W. H. Campbell, D. J. Degracia and E. R. Campbell

Purification and properties of $NADP^+$-dependent glutamate dehydrogenase from *Nitrobacter hamburgensis* strain *X*14 — 2151 — S. Weining and D. J. D. Nicholas

Characterization of two multispecific aspartate aminotransferase isozymes purified from bushbean shoots capable of transaminating aromatic amino acids and several DL-chloro-phenylalanines — 2155 — D. C. Taylor and F. Wightman

Influence of ring- and side-chain substituents on the transamination of aromatic amino acids by two multispecific aspartate-aromatic aminotransferase isozymes purified from bushbean shoots — 2167 — D. C. Taylor and F. Wightman

Malonyl-coenzyme A: anthocyanidin 3-glucoside malonyltransferase from flowers of *Callistephus chinensis* — 2181 — M. Teusch and G. Forkmann

Metabolism of tyramine and feruloyltyramine in TMV inoculated leaves of *Nicotiana tabacum* — 2185 — J. Negrel and P. Jeandet

A high-affinity $(Ca^{2+} + Mg^{2+})$-atpase from *Zea mays* microsomes — 2191 — S. G. Carter and C. L. Tipton

Inactivation of red beet β-glucan synthase by native and oxidized phenolic compounds — 2197 — T. L. Mason and B. P. Wasserman

Effect of chemical mutagens on steroidal sapogenins in *Trigonella* species — 2203 — S. C. Jain and M. Agrawal

Changes in volatile constituents of *Zingiber officinale* rhizomes during storage and cultivation — 2207 — F. Sakamura

Effects of temperature and light on the lipids of *Sphagnum magellanicum* — 2213 — K. Koskimies-Soininen and H. Nyberg

Ecological Biochemistry

Antifeedant active saponin from *Balanites roxburghii* stem bark — 2223 — D. C. Jain

Metabolites of insecticidal chromenes from the migratory grasshopper *Melanoplus sanguinipes* — 2227 — P. Proksch, M. B. Isman, L. Witte and T. Hartmann

Antibacterial activity and mode of action of plant flavonoids against *Proteus vulgaris* and *Staphylococcus aureus* — 2231 — A. Mori, C. Nishino, N. Enoki and S. Tawata

Biosynthesis

Biosynthetically simple C_{18}-alkamides from *Achillea* species — 2235 — H. Greger, O. Hofer and A. Werner

The biosynthesis of sesquiterpenoid phytoalexins in suspended callus cultures of *Nicotiana tabacum* — 2243 — C. J. W. Brooks, D. G. Watson, D. S. Rycroft and I. M. Freer

Metabolism of limonoids in the *Citrus* hybrid calamondin — 2247 — Z. Herman, R. D. Bennett, P. Ou, C. H. Fong and S. Hasegawa

ξ-Carotene and other carotenes in a *Phycomyces* mutant — 2251 — E. R. Bejarano, N. S. Govind and E. Cerda-Olmedo

Cell Culture and Biotechnology

Fatty acid composition of *Spirulina* strains grown under various environmental conditions — 2255 — Z. Cohen, A. Vonshak and A. Richmond

Accumulation of capsidiol in tobacco cell cultures treated with fungal elicitor — 2259 — J. Chappell, R. Nable, P. Fleming, R. A. Andersen and H. R. Burton

Cell cultures of *Centaurea cyanus* produce malonated anthocyanin in UV light — 2261 — K. Kakegawa, Y. Kaneko, E. Hattori, K. Koike and K. Takeda

Alkaloids from callus cultures of *Holarrhena floribunda* 2265 L. Bouillard, J. Homes and M. Vanhaelen

Chemotaxonomy

Carbohydrate composition and characterization of two unusual sugars from the blue green alga, *Spirulina platensis* 2267 K. M. Shekharam, L. V. Venkataraman and P. V. Salimath

Distribution and chemotaxonomic significance of acetylenic fatty acids in mosses of the dicranales 2271 G. Kohn, S. Demmerle, O. Vandekerkhove, E. Hartman and P. Beutelmann

An HPLC screening of some Italian Ranunculaceae for the lactone protoanemonin 2277 A. Bonora, G. Dall'Olio, A. Donini and A. Bruni

Twelve 6-oxygenated flavone sulphates from *Lippia nodiflora* and *L. canescens* 2281 F. A. Tomás-Barberán, J. B. Harborne and R. Self

Humilixanthin, a new betaxanthin from *Rivina humilis* 2285 D. Strack, D. Schmitt, H. Reznik, W. Boland, L. Grotjahn and V. Wray

Plant Chemistry

Pyrrole amides from *Achillea ageratifolia* 2289 H. Greger, C. Zdero and F. Bohlmann

Detection and measurement of fluoroacetate in plant extracts by ^{19}F NMR 2293 M. L. Baron, C. M. Bothroyd, G. I. Rogers, A. Staffa and I. D. Rae

A mucilage from *Hibiscus moscheutos* leaves 2297 M. Tomoda, R. Gonda, N. Shimizu, S. Nakanishi and H. Hikino

Isolation and crystal structure of a novel dihemiacetal bis-monoterpenoid from *Cymbopogon martinii* 2301 A. T. Bottini, V. Dev, D. J. Garfagnoli, H. Hope, P. Joshi, H. Lohani, C. S. Mathela and T. E. Nelson

Four new iridoid glucoside *p*-coumaroyl esters from *Ajuga decumbens* 2303 Y. Takeda, S. Tsuchida and T. Fujita

Eudesmane derivatives and highly oxygenated monoterpenes from Iranian *Artemisia* species 2307 A. Rustaiyan, A. Bamonieri, M. Raffatrad, J. Jakupovic and F. Bohlmann

The essential oil of *Nepeta nuda*. Identification of a new nepetalactone diastereoisomer 2311 H. L. de Pooter, B. Nicolai, L. F. de Buyck, P. Goetghebeur and N. M. Schamp

Melampolides from *Mikania cordifolia* 2315 A. B. Gutierrez, J. C. Oberti, V. E. Sosa and W. Herz

Eremophilane-, bisabolane- and shikimic acid-derivatives from Portugese *Senecio* species 2321 J. M. Cardoso, J. Jakupovic and F. Bohlmann

Sesquiterpene esters from *Tripterygium wilfordii* Hook fil. var. *Regelii*, structures of triptofordins A–C-1 2325 Y. Takaishi, K. Ujita, K. Nakano, K. Murakami and T. Tomimatsu

Further seco-labdanes from *Hebeclinium macrophyllum* 2331 U. Warning, J. Jakupovic, D. Friedrich, V. Castro and F. Bohlmann

Secoabietane diterpenes from *Coleus barbatus* 2337 A. Kelecom, T. C. Dos Santos and W. L. B. Medeiros

Three triterpenes from *Astraeus hygrometricus* 2341 Y. Takaishi, Y. Murakami, T. Ohashi, K. Nakano, K. Murakami and T. Tomimatsu

Triterpenoid prosaponins from leaves of *Maesa chisia* var. *Angustifolia* 2345 A. K. Chakravarty, B. Das and S. C. Pakrashi

Cardenolide glycosides of *Strophanthus divaricatus*	2351	R.-F. Chen, F. Abe, T. Yamauchi and M. Taki
Structures of compounds derived from the acyl moieties of quillajasaponin	2357	R. Higuchi and T. Komori
Quinones from *Ardisia cornudentata*	2361	Z. Tian, M. N. Chang, M. Sandrino, L. Huang, J. X. Pan, B. Arison, J. Smith and Y. K. T. Lam
Cyanogenic and phenylpropanoid glucosides from *Prunus grayana*	2363	H. Shimomura, Y. Sashida and T. Adachi
New prenylated phenolics from *Piper auritum*	2367	S. A. Ampofo, V. Roussis and D. F. Wiemer
Flavonones from *Lonchocarpus minimiflorus*	2371	V. Roussis, S. A. Ampofo and D. F. Wiemer
Flavonol and secoiridoid glycosides from *Coutoubea spicata*	2377	D. Schaufelberger, M. P. Gupta and K. Hostettmann
Xanthones from Formosan *Gentianaceous* plants	2381	C.-N. Lin, M.-I. Chung, K.-H. Gan and J.-R. Chiang
Alkaloids of *Erythroxylum zambesiacum* root-bark	2385	Y. M. A. El-Iman, W. C. Evans, R. J. Grout and K. P. A. Ramsey
Promorphinane and hasubanane alkaloids of *Stephania suberosa*	2391	A. Patra
Short Reports		
Trapping and identification of nitrogen oxides from soybean leaves	2397	L. Wei, M. Kogan and D. Fischer
Neobetanin: a new natural plant constituent	2399	D. Strack, U. Engel and V. Wray
Occurrence of the cyanogen linustatin in *Hevea brasiliensis*	2400	D. Selmar, R. Lieberei, B. Biehl, A. Nahrstedt, V. Schmidtmann and V. Wray
3-Farnesylindole from *Uvaria pandensis* verdc.	2402	M. H. H. Nkunya, H. Weenen and N. J. Koyi
Two guaianolides from *Centaurea collina*	2403	I. Fernández, B. García, F. J. Grancha and J. R. Pedro
Absolute stereochemistry of tagitinin A	2406	J. C. Sarma, R. P. Sharma, R. de Jong and C. H. Stam
Microglossic acid, an alicyclic diterpene and other constituents of *Microglossa zeylanica*	2408	A. A. L. Gunatilaka, B. Dhanabalasingham, L. Paredes, J. Jakupovic, F. Bohlmann and N. K. B. Adikaram
Diterpenoids from *Vellozia flavicans*	2409	Â. C. Pinto, D. H. T. Zocher, P. P. S. Queiroz and A. Kelecom
14α-methyl-5α-ergosta-9(11),24(28)-dien-3β-ol, a sterol from *Gynostemma pentaphyllum*	2412	T. Akihisa, T. Tamura and T. Matsumoto
(−)-aristotetralone: a 4-aryltetralone from *Aristolochia chilensis*	2414	A. Urzúa, A. J. Freyer and M. Shamma
A chromone from the root-bark of *Harrisonia abyssinica*	2415	A. M. Baldé, M. Vanhaelen and R. Ottinger
Malonated cyanidin 3-glucosides in *Zea mays* and other grasses	2417	J. B. Harborne and R. Self
Acylated luteolin glucosides from *Salix gilgiana*	2418	M. Mizuno, M. Kato, M. Iinuma, T. Tanaka, A. Kimura, H. Ohashi and H. Sakai

Flavonoids of *Wyethia* section *Agnorhiza* 2421 S. P. McCormick, K. A. Robson, J. Maze and B. A. Bohm

Dehydrodihydrorotenone and flemichapparin-B in *Tephrosia candida* 2423 M. Roy, P. K. Bhattacharya, S. Pal, A. Chowdhuri and N. Adityachaudhury

A new pterocarpan from the roots of *Tephrosia hildebrandtii* 2425 W. Lwande, M. D. Bentley, C. Macfoy, F. N. Lugemwa, A. Hassanali and E. Nyandat

Benzoxanthenone derivatives from *Polemannia montana* 2427 J. Jakupovic and F. Eid

Structure revision of emiline, a pyrrolizidine alkaloid from *Emilia flammea* 2430 R. H. Barbour and D. J. Robins

Pyrrolizidine alkaloids from *Senecio longilobus* and *Senecio glabellus* 2431 A. C. Ray, H. J. Williams and J. C. Reagor

Book Reviews

Natural Product Chemistry: edited by Atta-ur-Rahman 2435 J. B. Harborne

Flavonoids and Bioflavonoids, 1985: edited by L. Farkas, M. Gabor and F. Kallay 2435 J. B. Harborne

Number 9

Announcement

2437 1987 Tate & Lyle Award

Review Article Number 26

Isocitrate lyase from higher plants 2439 E. Giachetti, G. Pinzauti, R. Bonaccorsi, M. T. Vincenzini and P. Vanni

Growth and Metabolism

Monoclonal antibodies for the analysis and purification of isopentenyladenine cytokinins 2447 T. L. Wang, S. K. Cook and J. P. Knox

Relationships between nitrogen, amino acids and storage proteins in *Lupinus albus* seeds 2453 J. Mossé, J.-C. Huet and J. Baudet

Tiron as a substrate for mushroom tyrosinase 2459 V. Kahn and R. W. Miller

An enzyme linked immunosorbent assay for nitrate reductase using monoclonal antibodies 2467 P. N. Whitford, R. J. Fido and B. A. Notton

Identification of an apyrase activating protein and of calmodulin in *Solanum tuberosum* 2471 M. Mancilla, M. A. Valenzuela, M. Anich, A. M. Kettlun, O. Jara and A. Traverso-Cori

Utilization of bicarbonate by apple fruit phosphoenolpyruvate carboxylase 2475 M. M. Blanke, D. P. Hucklesby, B. A. Notton and F. Lenz

An unusual distribution of 4-substituted glutamic acids in *Sophora japonica* 2477 H. C. Winter and E. E. Dekker

Changes in chemical components of ripening oleaster fruits 2481 F. Sakamura and T. Suga

Comparison of the endogenous gibberellins in the shoots and roots of vernalized and non-vernalized Chinese Spring wheat seedlings 2485 J.-T. Lin and A. E. Stafford

Hydroxyl radical scavenging activity of flavonoids 2489 S. R. Husain, J. Cillard and P. Cillard

Ecological Biochemistry

A spiroketalenol ether phytoalexin from infected leaves and stems of *Coleostephus myconis* 2493 P. S. Marshall, J. B. Harborne and G. S. King

NADPH: biochanin A oxidoreductase from the fungus *Fusarium javanicum* 2495 D. Schlieper and W. Barz

Naphthofurans produced by *Fusarium oxysporum* isolated from citrus 2499 J. H. Tatum, R. A. Baker and R. E. Berry

Cytotoxic naphthoquinones, molluscicidal saponins and flavonols from *Diospyros zombensis* 2501 F. Gafner, J.-C. Chapuis, J. D. Msonthi and K. Hostettmann

Ecdysteroids from *Pfaffia iresinoides* and reassignment of some ^{13}C NMR chemical shifts 2505 N. NISHIMOTO, Y. SHIOBARA, M. FUJINO, S. INOUE, T. TAKEMOTO, F. DE OLIVEIRA, G. AKISUE, M. K. AKISUE, G. HASHIMOTO, O. TANAKA, R. KASAI and H. MATSUURA

Biosynthesis

Biosynthesis of mycosporines: mycosporine glutaminol in *Trichothecium roseum* 2509 J. FAVRE-BONVIN, J. BERNILLON, N. SALIN and N. ARPIN

The metabolism of α-ionylidene compounds by *Cercospora rosicola* 2515 S. J. NEILL, R. HORGAN, D. C. WALTON and C. A. M. MERCER

The microbiological transformation of some isoatisene diterpenoids into isoatisagibberellins and isoatisenolides by *Gibberella fujikuroi* 2521 B. M. FRAGA and R. GUILLERMO

Carotene biosynthesis by a cell extract of *Aspergillus giganteus* mut *alba* 2525 M. EL-JACK, P. M. BRAMLEY and A. MACKENZIE

Cell Culture and Biotechnology

Purification and some properties of five anthraquinone-specific glucosyltransferases from *Cinchona succirubra* cell suspension culture 2531 H. E. KHOURI and R. K. IBRAHIM

Chemotaxonomy

Sterols and fatty acids of the red tide flagellates *Heterosigma akashiwo* and *Chattonella antiqua* (Raphidophyceae) 2537 P. D. NICHOLS, J. K. VOLKMAN, G. M. HALLEGRAEFF and S. I. BLACKBURN

Norrosane derivatives and other constituents from *Hymenothrix wislizenii* 2543 J. JAKUPOVIC, A. SCHUSTER, F. BOHLMANN, H. SANCHEZ, V. and X. A. DOMINGUEZ

Coumarin glycosides from *Citrus* flavedo 2547 D. MCHALE, P. P. KHOPKAR and J. B. SHERIDAN

Biflavones and the affinities of *Cupressus funebris* 2551 P. A. GADEK and C. J. QUINN

Biflavonoids in the primitive monocots *Isophysis tasmanica* and *Xerophyta plicata* 2553 C. A. WILLIAMS, J. B. HARBORNE and F. A. TOMAS-BARBERAN

A chemotaxonomic study of flavonoids in the leaves of six *Trichosanthes* species 2557 M. YOSHIZAKI, H. FUJINO, M. MASUYAMA, M. ARISAWA and N. MORITA

Flavonoids from *Pinus morrisonicola* 2559 J.-M. FANG, C.-F. CHANG and Y.-S. CHENG

Plant Chemistry

Cyclohexene epoxides, (+)-pandoxide, (+)-β-senepoxide and (−)-pipoxide, from *Uvaria pandensis* 2563 M. H. H. NKUNYA, H. WEENEN, N. J. KOYI, L. THIJS and B. ZWANENBURG

Polar epicuticular lipids of *Lycopersicon pennellii* 2567 B. A. BURKE, G. GOLDSBY and J. B. MUDD

Positional distribution of fatty acids in lipids of the marine diatom *Phaeodactylum tricornutum* 2573 T. ARAO, A. KAWAGUCHI and M. YAMADA

Thymol derivatives from *Calea nelsonii* 2577 M. MARTÍNEZ, V., A. SÁNCHEZ, F. and P. JOSEPH-NATHAN

Polyhydroxyagarofuran derivatives from *Tripterygium wilfordii* H. 2581 Y. TAKAISHI, K. UJITA, K. KIDA, M. SHIBUYA and T. TOMIMATSU

Glechomanolides and eudesmanolides from *Smyrnium perfoliatum* 2585 N. GÖREN and A. ULUBELEN

Sesquiterpene lactones from *Montanoa gigas* and the crystal structure of gigantanolide A 2589 L. QUIJANO, J. S. CALDERÓN, F. GÓMEZ-GARIBAY, M. ANGULO-M. and T. RÍOS

Sesquiterpene lactones from *Gutenbergia cordifolia*	2593	Y. Fujimoto, T. Kinoshita, N. Ikekawa and J. Mungarulire
Sesquiterpene lactones from the genus *Brachylaena*	2597	C. Zdero and F. Bohlmann
Further sesquiterpene lactones from the genus *Dittrichia*	2603	A. Rustaiyan, J. Jakupovic, T. V. Chau-Thi, F. Bohlmann and A. Sadjadi
Triterpenoids from *Cornus capitata*	2607	R. S. Bhakuni, Y. N. Shukla and R. S. Thakur
New metabolites from *Psorospermum tenuifolium*	2611	G. D. Monache, F. D. Monache, R. Di Benedetto and J. U. Oguakwa
Benzoyl esters and amides, styrylpyrones and neolignans from the fruits of *Aniba riparia*	2615	J. M. Barbosa-Filho, M. Yoshida, O. R. Gottlieb, R. de C. S. B. C. Barbosa, A. M. Giesbrecht and M. C. M. Young
Phenolic and acetylenic metabolites from *Artemisia assoana*	2619	V. Martínez, O. Barberá, J. Sánchez-Parareda and J. Alberto Marco
Revision of the structures of rhazicine and rhazimine, two alkaloids from *Melodinus acutiflorus*	2625	H. Wen-lan, Z. Ji-ping, U. Piantini, R. Prewo and M. Hesse

Short Reports

Sesquiterpenes from *Celastrus pringlei*	2631	A.-A. Sánchez, J. Cárdenas and L. Rodríguez-Hahn
Sesquiterpene lactones from the fruits of *Smyrnium connatum*	2633	N. Gören and A. Ulubelen
Two farnesol derivatives from *Cousinia adenostica*	2635	A. Rustaiyan, Z. Sharif and A. S. Sadjadi
Linear diterpenoids from *Cystoseira balearica*	2637	V. Amico, P. Neri, M. Piattelli and G. Ruberto
Labdane diterpenes from *Brickellia glomerata*	2639	J. S. Calderón, L. Quijano, F. Gómez-Garibay, M. Morán and T. Ríos
A novel withanolide from *Datura metel*	2641	S. Siddiqui, N. Sultana, S. S. Ahmad and S. I. Haider
Identification of 24-methylenelophenol from heartwood of *Azadirachta indica*	2644	R. Banerji, G. Misra and S. K. Nigam
2′-*p*-Methoxycoumaroylaloeresin, a *C*-glucoside from *Aloe excelsa*	2646	P. P. Mebe
X-ray structure of psiadiarabin, a flavone from *Psiadia arabica*	2648	M. A. Al-Yahya, M. S. Hifnawy, J. S. Mossa, F. S. El-Feraly, D. R. McPhail and A. T. McPhail
Geovanine, a new azaanthracene alkaloid from *Annona ambotay* Aubl.	2650	A. B. De Oliveira, G. G. De Oliveira, F. Carazza and J. G. S. Maia

Book Reviews

Preparative Chromatographic Techniques—Applications in Natural Product Isolation: by K. Hostettmann, M. Hostettmann and A. Marston	2653	J. B. Harborne
Alkaloids: Chemical and Biological Perspectives, Volume 4: edited by S. W. Pelletier	2653	J. B. Harborne
The Phytochemistry of the Flora of Qatar: by A. M. Rizk	2654	J. B. Harborne
Abstracts of Chinese Medicines	2654	J. B. Harborne
The Wealth of India, Raw Materials, Volume 1a	2654	J. B. Harborne
The Useful Plants of India	2654	J. B. Harborne

Number 10

Growth and Metabolism

Inhibition of the methionine cycle enzymes 2655 J. H. Miyazaki and S. F. Yang

Amino acids in stigmas of *Pennisetum americanum* 2661 J. J. Evans, R. Pressey and B. J. Reger

Purification and characterization of bifunctional dehydroquinase-shikimate: NADP oxidoreductase from pea seedlings 2665 D. M. Mousdale, M. S. Campbell and J. R. Coggins

The effect of fungal protocatechuate 3,4-dioxygenase on sodium lignosulphonate fractions 2671 M. Wojtaś-Wasilewska and J. Luterek

Effect of Tiron on monohydroxy and *o*-dihydroxyphenolase activity of mushroom tyrosinase 2675 V. Kahn and A. Andrawis

Glucomannan synthase from suspension cultures of *Pinus sylvestris* 2679 L. Ramsden and D. H. Northcote

Ecological Biochemistry

Molluscicidal saponins from *Swartzia simplex* 2685 C. Borel, M. P. Gupta and K. Hostettmann

Phytophthora megasperma culture filtrate and cell wall preparation stimulate glyceollin production and reduce cell viability in suspension cultures of soybean 2691 I. S. Bhandal, J. D. Paxton and J. M. Widholm

Biosynthesis

Absolute configuration of norcoronatine 2695 R. E. Mitchell, M. C. Pirrung and G. M. McGeehan

Difference between uracilylalanine synthases and cysteine synthases in *Pisum sativum* 2699 F. Ikegami, M. Kaneko, F. Lambein, Y.-H. Kuo and I. Murakoshi

1,2-Hydrogen shifts during the biosynthesis of patchoulenes in *Pogostemon cablin* 2705 A. Akhila, P. K. Sharma and R. S. Thakur

Inhibition of sterol biosynthesis and accumulation of 2,3-oxidosqualene in bramble cell suspension cultures treated with 2-aza-2,3-dihydro-squalene and 2-aza-2,3-dihydrosqualene-*N*-oxide 2709 P. Schmitt, R. Gonzales, P. Benveniste, M. Ceruti and L. Cattel

Triterpene ester synthesis in latex of *Euphorbia* species 2715 F. Warnaar

The estimation of L-phenylalanine ammonia-lyase shows phenylpropanoid biosynthesis to be regulated by L-phenylalanine supply and availability 2723 A. da Cunha

The *E*/*Z* isomerization step in the biosynthesis of *Z*-coniferyl alcohol in *Fagus grandifolia* 2729 N. G. Lewis, P. Dubelsten, T. L. Eberhardt, E. Yamamoto and G. H. N. Towers

Cell Culture and Biotechnology

The production of secondary metabolites by *Digitalis lanata* during CO_2 enrichment and water stress 2735 T. Stuhlfauth, K. Klug and H. P. Fock

Production of tocopherols by cell culture of safflower 2741 T. Furuya, T. Yoshikawa, T. Kimura and H. Kaneko

Differential solasodine accumulation in photoautotrophic and heterotrophic tissue cultures of *Solanum laciniatum* 2749 A. J. Conner

Chemotaxonomy

Terpenoid constituents of three taxa of *Monardella* 2751 B. D. Tanowitz, D. M. Smith and S. A. Junak

Terpenoids of *Piptothrix sinaloae* 2753 M. Miski, D. A. Gage and T. J. Mabry

Dimalonated anthocyanins from the flowers of *Salvia splendens* and *S. coccinea* 2759 F. A. Tomás-Barberán, J. B. Harborne and R. Self

Cyanidin 3-*p*-coumaroylglucoside in *Camellia* species and cultivars 2761 N. SAITO, M. YOKOI, M. YAMAJI and T. HONDA

Plant Chemistry

Sesquiterpene lactones and other constituents from *Eriocephalus* species 2763 C. ZDERO, F. BOHLMANN and M. MÜLLER

Artanomaloide, a dimeric guaianolide and phenylalanine derivatives from *Artemisia anomala* 2777 J. JAKUPOVIC, Z.-L. CHEN and F. BOHLMANN

Clerodane diterpenes from *Aristolochia* species 2781 L. M. X. LOPES, V. DA S. BOLZANI and L. M. V. TREVISAN

Triterpenes from *Maytenus horrida* 2785 A. G. GONZÁLEZ, E. A. FERRO and A. G. RAVELO

Entada saponin-III, a saponin isolated from the bark of *Entada phaseoloides* 2789 Y. OKADA, S. SHIBATA, T. IKEKAWA, A. M. J. JAVELLANA and O. KAMO

Ganoderic acid derivatives and ergosta-4,7,22-triene-3,6-dione from *Ganoderma lucidum* 2797 M. HIROTANI, I. ASAKA, C. INO, T. FURUYA and M. SHIRO

Cyclotriterpenes from the heartwood of *Pterospermum heyneanum* 2805 A. S. R. ANJANEYULU and S. N. RAJU

Aromatic glycosides from *Berchemia racemosa* 2811 S. INOSHIRI, M. SASAKI, H. KOHDA, H. OTSUKA and K. YAMASAKI

6-Nitro-*iso*-vanillic acid, an unusual chromogen from the genus *Cortinarius* 2815 M. GILL, A. GIMÉNEZ and R. J. STRAUCH

Chromones from *Dictyoloma incanescens* 2819 A. M. CAMPOS, D. D. KHAC and M. FETIZON

Phenylpropanoid derivatives of catechin, epicatechin and phylloflavan from *Phyllocladus trichomanoides* 2825 L. Y. FOO

Flavonoids from *Gutierrezia texana* var. *texana* 2831 R. Z. LI, N. FANG and T. J. MABRY

Flavonolignoid from the fruit of *Iryanthera laevis* 2835 L. GARZON N., L. E. CUCA S., J. C. MARTINEZ V., M. YOSHIDA and O. R. GOTTLIEB

Alkaloids of *Strychnos johnsonii* 2839 G. MASSIOT, P. THÉPENIER, M.-J. JACQUIER, L. LE MEN-OLIVER, R. VERPOORTE and C. DALAUDE

Short Reports

Composition of leaf epicuticular waxes of *Pteridium* subspecies 2847 E. A. BAKER and R. E. GASKIN

A polyacetylenic compound from *Panax ginseng* roots 2849 S. C. SHIM, S. CHANG, C. W. HUR and C. K. KIM

Acetylenes from the callus of *Panax ginseng* 2850 Y. FUJIMOTO and M. SATOH

Four terpenoids from *Cedrus libanotica* 2852 H. AVCIBASI, H. ANIL and M. TOPRAK

Nerolidol derivatives from *Asteriscus sericeus* 2854 J. JAKUPOVIC, L. LEHMANN, F. BOHLMANN and A. A. HOGDSON

Sesquiterpene lactones from *Achillea micrantha* 2856 A. RUSTAIYAN, Z. SHARIF, A. TAJARODI and A. S. SADJADI

Sesquiterpene lactones from *Jurinella moschus* 2857 A. RUSTAIYAN and M. T. GANJI

2-Deoxychamaedroxide, a neo-clerodane diterpenoid from *Teucrium divaricatum* 2859 M. BRUNO, F. PIOZZI, G. SAVONA, B. RODRÍGUEZ, M. C. DE LA TORRE and O. SERVETTAZ

A new diterpenoid from *Ericameria laricifolia* 2861 J. J. Hoffmann, S. D. Jolad, B. N. Timmermann, R. B. Bates, F. A. Camou and T. J. Siahaan

5α-Cholestane-3,6-dione from the red alga *Acantophora spicifera* 2864 S. Wahidulla, L. D'Souza and J. Patel

A prenylated chalcone from *Crotalaria medicaginea* 2866 G. V. R. Rao, P. S. Rao and K. R. Raju

Quercetin coumaroyl glucorhamnoside from *Ginkgo biloba* 2869 C. Nasr, A. Lobstein-Guth, M. Haag-Berrurier and R. Anton

A new glycosyl flavone from *Fagraea obovata* wall 2871 M. A. Qasim, S. K. Roy, M. Kamil and M. Ilyas

Two homoisoflavones from *Ophiopogon japonicus* 2873 Y. Zhu, K. Yan and G. Tu

Revision of the stereochemistry of koumidine 2875 Y. Schun and G. A. Cordell

Book Review

Nuclear Magnetic Resonance: edited by H. F. Linskens and J. F. Jackson 2877 J. B. Harborne

Number 11

Announcement 2879

Growth and Metabolism

A conformational study of the topographical requirements of a phytotropin recognition site on the naphthylphthalamic acid receptor 2881 G. F. Katekar, D. A. Winkler and A. E. Geissler

A natural substance that regulates the cell cycle in complex plant tissues 2891 L. S. Evans, W. A. Tramontano and R. Gill

A radioimmunoassay for the dimethyl esters of GA_{24} and GA_{19} 2895 S. Kurogochi, I. Yamaguchi, M. Feyerabend, N. Murofushi, N. Takahashi, S. Kuyama and E. W. Weiler

A simple histochemical method for locating enzymes in plant tissue using nitrocellulose blotting 2901 J. Spruce, A. M. Mayer and D. J. Osborne

Fractionation of Jerusalem artichoke phenolase by immobilized copper affinity chromatography 2905 J. Zawistowski, R. J. Weselake, G. Blank and E. D. Murray

α-D-Mannosidase from the aleurone layers of resting wheat grains: sugar-depleted forms 2909 S. Conti, G. Carratu' and M. Giannattasio

Purification and properties of leucine aminotransferase from soybean seedlings 2913 U. Pathre, A. K. Singh, P. N. Viswanathan and P. V. Sane

Hydroxycinnamic acid esters of isocitric acid: accumulation and enzymatic synthesis in *Amaranthus cruentus* 2919 D. Strack, P. Leicht, M. Bokern, V. Wray and L. Grotjahn

Phospholipid metabolism in roots and microsomes of sunflower seedlings: inhibition of choline phosphotransferase activity by boron 2923 A. Belver and J. P. Donaire

Partial purification and properties of a protein kinase C type enzyme from plants 2929 D. C. Elliott and Y. S. Kokke

Polyphenol interactions: astringency and the loss of astringency in ripening fruit 2937 T. Ozawa, T. H. Lilley and E. Haslam

Ecological Biochemistry

Substrate peroxidation patterns in vascular plants and their modification by exposure to mercury vapour 2943 B. Z. Siegel, T. Redman and S. M. Siegel

Solanum berthaultii trichomes contain unique polyphenoloxidases and a peroxidase 2949 P.-Y. Bouthyette, N. Eannetta, K. J. Hannigan and P. Gregory

On the presence of falcarinol in Araliaceae 2955 P. M. Boll and L. Hansen

Two polyacetylenic phytoalexins from *Arctium lappa* 2957 M. Takasugi, S. Kawashima, N. Katsui and A. Shirata

The uptake of ferulic and *p*-hydroxybenzoic acids by *Cucumis sativus* 2959 J. R. Shann and U. Blum

Phenolic glycosides from *Lilium longiflorum* 2965 Y. Shoyama, K. Hatano, I. Nishioka and T. Yamagishi

Five chromenes from *Blepharispermum subsessile* 2969 M. M. Kulkarni, B. A. Nagasampagi, S. G. Deshpande and R. N. Sharma

Neoflavonoids from the stem bark of *Calophyllum verticillatum* 2973 B. Ravelonjato, N. Kunesch and J. E. Poisson

Biosynthesis

The utilization of exogenously supplied ferulic acid in lignin biosynthesis 2977 J. R. Shann and U. Blum

Cell Culture and Biotechnology

Glycosylation of 2-phenylpropionic acid and its ethyl ester in suspension cultures of *Nicotiana tabacum*, *Dioscoreophyllum cumminsii* and *Aconitum japonicum* 2983 T. Furuya, M. Ushiyama, Y. Asada and T. Yoshikawa

Biotransformation of isopapaverine by *Silene alba* cell suspensions 2991 H. Christinaki, F. Bister-Miel, A. Hammoumi, M. Bury, J.-L. Guignard and C. Viel

Chemotaxonomy

Anthraquinone, anthrone and phenylpyrone components of *Aloe nyeriensis* var. *kedongensis* leaf exudate 2995 J. M. Conner, A. I. Gray, T. Reynolds and P. G. Waterman

Deoxyaustrocortilutein and deoxyaustrocortirubin, tetrahydroanthraquinones from the genus *Cortinarius* 2999 M. Gill and A. F. Smrdel

Quaternary alkaloids of *Thalictrum cultratum* 3003 C.-Y. Gao, Z.-C. Lou, F.-T. Lin, M.-C. Lin and P. L. Schiff, Jr

Plant Chemistry

Investigation of the essential oil of Vietnamese ginger 3005 T. A. van Beek, M. A. Posthumus, G. P. Lelyveld, H. V. Phiet and B. T. Yen

Iridoid glycosides from *Penstemon confertus* 3011 B. Gering, P. Junior and M. Wichtl

Vebraside, an iridoid glucoside from *Verbena brasiliensis* 3015 A. Franke and H. Rimpler

Nimbidiol, a modified diterpenoid of the root-bark of *Azadirachta indica* 3021 P. L. Majumder, D. C. Maiti, W. Kraus and M. Bokel

Diterpenes of *Ericameria linearifolia* 3025 S. J. Dentali, J. J. Hoffman, S. D. Jolad and B. N. Timmermann

Cembrane-derived diterpenoid having a carbotricyclic skeleton 3029 R. Uegaki, T. Fujimori, N. Ueda and A. Ohnishi

Furanediterpenes from *Baccharis thymifolia* 3033 J. R. Saad, M. J. Pestchanker and O. S. Giordano

Labdane diterpenoids from *Halimium viscosum* and *H. verticilatum* 3037 J. G. Urones, I. S. Marcos, D. D. Martin, F. M. S. B. Palma and J. M. Rodilla

Latex constituents of *Euphorbia candelabrum*, *E. grantii*, *E. tirucalli* and *Synadenium grantii* 3041 B. Uzabakiliho, C. Largeau and E. Casadevall

Stereochemical studies on boronolide, an α-pyrone from *Tetradenia barberae* 3047 M. T. Davies-Coleman and D. E. A. Rivett

A cytotoxic tetralone derivative from *Pararistolochia flos-avis* 3051 N. J. Sun, C. Chang and J. M. Cassady

Benzofuran derivatives from *Ageratum houstonianum* 3055 M. Breuer, H. Budzikiewicz, R. Siebertz and P. Proksch

Flavonoids of *Artemisia judaica*, *A. monosperma* and *A. herba-alba* 3059 N. A. M. Saleh, S. I. El-Negoumy and M. M. Abou-Zaid

Short Reports

Thermal properties of 1-hexadecanoyl-2-*trans*-3-hexadecenoyl phosphatidylglycerol 3065 D. G. Bishop and J. R. Kenrick

A novel oxo fatty acid in *Plantago ovata* seed oil 3067 S. Jamal, I. Ahmad, R. Agarwal, M. Ahmad and S. M. Osman

Volatile mono- and sesquiterpeneoids from *Kleinia pendula* 3069 A. H. Elmi, M. H. Farah, E. Fattorusso, S. Magno and L. Mayol

The volatile phyllode oil of *Acacia spirorbis* 3071 J. J. Brophy, E. V. Lassak and T. Sévenet

Sesquiterpenes from seeds of *Maytenus boaria* 3073 J. Becerra, L. Gaete, M. Silva, F. Bohlmann and J. Jakupovic

Two new sesquiterpene esters from *Armillaria mellea* 3075 D. M. X. Donnelly, P. F. Quigley, D. J. Coveney and J. Polonsky

Tanavulgarol, an oxygenated sesquiterpene with an uncommon skeleton from *Tanacetum vulgare* 3077 A. Chandra, L. N. Misra and R. S. Thakur

Salvisyriacolide, a sesterterpene from *Salvia syriaca* 3078 A. Rustaiyan and A. Sadjadi

Arboreic acid: a pentacyclic triterpenoid from *Myrianthus arboreus* 3080 F. N. Ngounou, D. Lontsi, J. F. Ayafor and B. L. Sondengam

Triterpene fatty acid esters and flavonoids from *Inula britannica* 3082 S. Öksüz and G. Topcu

A new neoquassin derivative from *Quassia amara* 3085 G. Grandolini, C. G. Casinovi, P. Barbetti and G. Fardella

Sterols from four species of Liliaceae 3088 M. C. Brunengo, O. L. Tombesi and E. G. Gros

(−)Flacourtin, a phenolic glucoside ester from *Flacourtia indica* 3090 P. K. Bhaumik, K. P. Guha, G. K. Biswas and B. Mukherjee

5,7,3′,4′-Tetrahydroxy-6-methoxyflavanone from *Eupatorium subhastatum* 3092 G. Ferraro, V. Martino, G. Borrajo and J. D. Coussio

A 2,2-dimethylpyranoflavonol from *Citrus nobilis* 3094 T.-S. Wu

Revised structure of neoflavone in *Coutarea hexandra* 3096 M. Iinuma, T. Tanaka, K. Hamada, M. Mizuno, F. Asai, G. Reher and L. Kraus

Book Reviews

Gas Chromatography/Mass Spectrometry: edited by H. F. Linskens and J. F. Jackson 3099 J. B. Harborne

Orchid Biology, Reviews and Perspectives, Volume 4: edited by J. Arditti 3099 J. B. Harborne

Microbial Growth on C_1 Compounds. Proceedings of the 5th International Symposium: edited by H. W. van Verseveld and J. A. Duine 3100 P. J. Large

Recognition in microbe–plant symbiotic and pathogenic interactions: edited by B. Lugtenberg 3100 J. B. Harborne

Excitation Energy and Electron Transfer in Photosynthesis: edited by Govindjee, J. Barber, W. A. Cramer, J. H. C. Goedheer, J. Lavorel, R. Marcelle and B. Zilinskas 3101 J. R. Gallon

Immunology in Plant Sciences (Modern Methods of Plant Analysis. New Series, Vol. 4): edited by H.-F. Linskens and J. F. Jackson 3101 P. Hedden

Plant Growth Substances 1985: edited by M. Bopp 3102 J. D. Ross

Number 12

Review Article Number 27

A chemosystematic analysis of tribes of Asteraceae involving sesquiterpene lactones and flavonoids 3103 V. DE P. EMERENCIANO, Z. S. FERREIRA, M. A. C. KAPLAN and O. R. GÓTTLIEB

Growth and Metabolism

Biogenesis of carbon monoxide: production by fungi and seed plants in the dark 3117 S. M. SIEGEL and B. Z. SIEGEL

Effect of sucrose level on rice grain deposition in detached panicle system 3121 R. M. VILLAREAL and B. O. JULIANO

A proteinaceous competitive inhibitor of lipase isolated from *Helianthus annuus* seeds 3127 G. W. CHAPMAN, JR

Effect of different phenols on the NADH-oxidation catalysed by a peroxidase from lupin 3133 M. A. PEDREÑO, F. SABATER, R. MUÑOZ and F. GARCÍA-CARMONA

Differential effects of pectolytic enzymes on tomato polyuronides *in vivo* and *in vitro* 3137 G. B. SEYMOUR, Y. LASSLETT and G. A. TUCKER

Effect of cyclic analogues of valproic acid on glutamic acid decarboxylase activity as determined by different methods 3141 M. L. SETHI, K. R. SCOTT and A. A. ACHEAMPONG

Comparison of effects of ABA and IAA on phospholipid bilayers 3145 W. STILLWELL, B. BRENGLE, D. BELCHER and S. R. WASSALL

Influence of cold temperatures on leaf lipids of *Hibiscus rosa-sinensis* 3151 H. E. NORDBY and G. YELENOSKY

Expression of the developmental mutant *bz-m4 Derivative* 6856 in maize seedlings 3159 E. KUHN and A. S. KLEIN

The metabolism of solanidine by microsomal fractions from *Solanum chacoense* 3163 S. OSMAN, S. L. SINDEN, K. DEAHL and R. MOREAU

Ecological Biochemistry

The pattern of distribution of lanthanide elements in soils and plants 3167 B. MARKERT

Pollen and flower volatiles in two *Rosa* species 3171 H. E. M. DOBSON, J. BERGSTRÖM, G. BERGSTRÖM and I. GROTH

Antifungal activity of pisiferic acid derivatives against the rice blast fungus 3175 K. KOBAYASHI, C. NISHINO, H. TOMITA and M. FUKUSHIMA

Lichen acids, plant growth inhibitors from *Usnea longissima* 3181 Y. NISHITOBA, H. NISHIMURA, T. NISHIYAMA and J. MIZUTANI

Dihydrostilbene phytoalexins from *Dioscorea rotundata* 3187 D. E. FAGBOUN, S. K. OGUNDANA, S. A. ADESANYA and M. F. ROBERTS

Polyphenols and chemical defence of the leaves of *Quercus robur* 3191 A. SCALBERT and E. HASLAM

Glycine-betaine in wilted barley reduces the effects of gramine on aphids 3197 G. E. ZÚÑIGA and L. J. CORCUERA

Biosynthesis

Temporal regulation in the synthesis of concanavalin A and α-mannosidase in the seeds of *Canavalia ensiformis* 3201 M. RAYCHAUDHURI, K. NIYOGI and M. SINGH

Foliage sesquiterpenes and diterpenes of *Podocarpus spicatus* 3207 S. D. LORIMER and R. T. WEAVERS

Cell Culture and Biotechnology

Manganese induced peroxidation of thylakoid lipids and changes in chlorophyll-*a* fluorescence during aging of cell free chloroplasts in light 3217 S. PANDA, A. K. MISHRA and U. C. BISWAL

Alterporriol A: a modified bianthraquinone from *Alternaria porri* 3221 R. SUEMITSU, T. YAMAMOTO, T. MIYAI and T. UESHIMA

Phenolic glycoside composition of leaves and callus cultures of *Digitalis purpurea*	3225	M. Matsumoto, S. Koga, Y. Shoyama and I. Nishioka
Hydroxycinnamic acid esters of glucuronosylglucose from cell suspension cultures of *Chenopodium rubrum*	3229	M. Bokern, V. Wray and D. Strack
Biotransformation of anhydrovinblastine to vinblastine by a cell-free extract of *Catharanthus roseus* cell suspension cultures	3233	T. Endo, A. Goodbody, J. Vukovic and M. Misawa
Preparation of dehydrobenzylisoquinolines by immobilized (*S*)-tetrahydroprotoberberine oxidase from plant cell cultures	3235	M. Amann and M. H. Zenk
Relationship between *Agrobacterium rhizogenes* transformed hairy roots and intact, uninfected *Nicotiana* plants	3241	A. J. Parr and J. D. Hamill
Chemotaxonomy		
Imidazole, a new natural product from the Leguminosae	3247	A. R. Hayman and D. O. Gray
Internal and external leaf flavonoids of *Pericome caudata*	3249	E. Wollenweber and K. Mann
Benzophenanthridine alkaloids from the stem bark of a *Zanthoxylum* species	3251	K. M. Ng, A. I. Gray and P. G. Waterman
Plant Chemistry		
Unusual nonprotein imino acid and its relationship to phenolic and nitrogenous compounds in *Copaifera*	3255	R. Figliuolo, S. Naylor, J. Wang and J. H. Langenheim
Properties of fraction of rice hull	3261	B. O. Juliano, C. C. Maniñgat and C. G. Pascual
Hydrocarbons and wax esters from seven species of mangrove leaves	3265	S. Misra, A. K. Datta, S. Chattopadhyay, A. Choudhury and A. Ghosh
Characterization of anti-complementary acidic heteroglycans from the seed of *Coix lacryma-jobi* var. *ma-yuen*	3269	H. Yamada, S. Yanahira, H. Kiyohara, J.-C. Cyong and Y. Otsuka
Sesquiterpene lactones of *Piptothrix pubens*	3277	M. Miski, D. A. Gage and T. J. Mabry
neo-Clerodane diterpenoids and other constituents from *Baccharis* species	3281	F. Faini, P. Rivera, M. Mahú and M. Castillo
Teucretol, a *neo*-clerodane diterpenoid from *Teucrium creticum*	3285	G. Savona, F. Piozzi, M. Bruno, G. Domínguez, B. Rodríguez and O. Servettaz
ent-Clerodane diterpenoids from *Rhynchospermum verticillatum*	3289	M. Seto, T. Miyase and A. Ueno
cis-Clerodane-type diterpene lactones from *Ephemerantha comata*	3293	M. Niwa, N. Kihira, Y. Hirata, M. Tori, T.-S. Wu and C.-S. Kuoh
Diterpenoid abietane quinones isolated from *Salvia regla*	3297	M. Hernández, B. Esquivel, J. Cárdenas, L. Rodríguez-Hahn and T. P. Ramamoorthy
Triterpenes from *Simaba multiflora*	3301	M. Arisawa, A. Fujita, N. Morita, P. J. Cox, R. A. Howie and G. A. Cordell
Triterpenoids from *Salvia deserta*	3305	G. Savona, M. Bruno, B. Rodríguez and J. L. Marco
Dysoxylin, a limonoid from *Dysoxylum richii*	3309	M. K. Jogia and R. J. Andersen
A new physalin from *Physalis alkekengi*: structure of physalin L	3313	M. Kawai, T. Matsuura, S. Kyuno, H. Matsuki, M. Takenaka, T. Katsuoka, Y. Butsugan and K. Saito
A cinnamic acid derivative and a coumarin from *Murraya exotica*	3319	B. R. Barik and A. B. Kundu

Three dihydroisocoumarin glucosides from *Hydrangea macrophylla* subsp. *serrata* 3323 T. Hashimoto, M. Tori and Y. Asakawa

Four acylated flavonol glycosides from leaves of *Strychnos variabilis* 3331 T. Brasseur and L. Angenot

^{13}C NMR studies of some naturally occurring amentoflavone and hinokiflavone biflavonoids 3335 K. R. Markham, C. Sheppard and H. Geiger

Quinoline alkaloids and cytotoxic lignans from *Haplophyllum tuberculatum* 3339 G. M. Sheriha, K. Abouamer, B. Z. Elshtaiwi, A. S. Ashour, F. A. Abed and H. H. Alhallaq

Short Reports

4-Hydroxy-*N*-methylproline analogues in *Melaleuca* spp. 3343 G. P. Jones, B. P. Naidu, L. G. Paleg, E. R. T. Tiekink and M. R. Snow

Synthesis of retrofractamide A 3345 A. Banerji, D. Bandyopadhyay and A. K. Siddhanta

Isolation of gliovictin from the marine deuteromycete *Asteromyces cruciatus* 3347 J. Shin and W. Fenical

Monohydroxylated cyclopentenone cyanohydrin glucosides of flacourtiaceae 3348 J. W. Jaroszewski and E. S. Olafsdottir

3-Caren-5-one from *Kaempferia galanga* 3350 F. Kiuchi, N. Nakamura and Y. Tsuda

A dimer of *d*-pinocarvone from *Cedronella canariensis* 3351 M. C. Carreiras, B. Rodríguez, R. E. López-García and R. M. Rabanal

Eranthemoside, a new iridoid glucoside from *Eranthemum pulchellum* (Acanthaceae) 3353 H. F. W. Jensen, S. R. Jensen and B. J. Nielsen

Variability in composition of the essential oil of *Calamintha nepeta* 3355 H. L. De Pooter, P. Goetghebeur and N. Schamp

Caryophyllene derivatives from *Pulicaria arabica* 3356 S. Hafez, T. M. Sarg, M. M. El-domiaty, A. A. Ahmed, F. R. Melek and F. Bohlmann

Minor sesquiterpenes of flowers of *Parthenium hysterophorus* 3359 V. K. Sethi, S. K. Koul, S. C. Taneja and K. L. Dhar

A labdane diterpenoid and sterol from *Lagerstroemia lancasteri* 3361 P. K. Chaudhuri

Isomeric 2,3-seco-hopene lactones form *Swertia petiolata* 3363 S. Bhan, R. Kumar, A. K. Kalla and K. L. Dhar

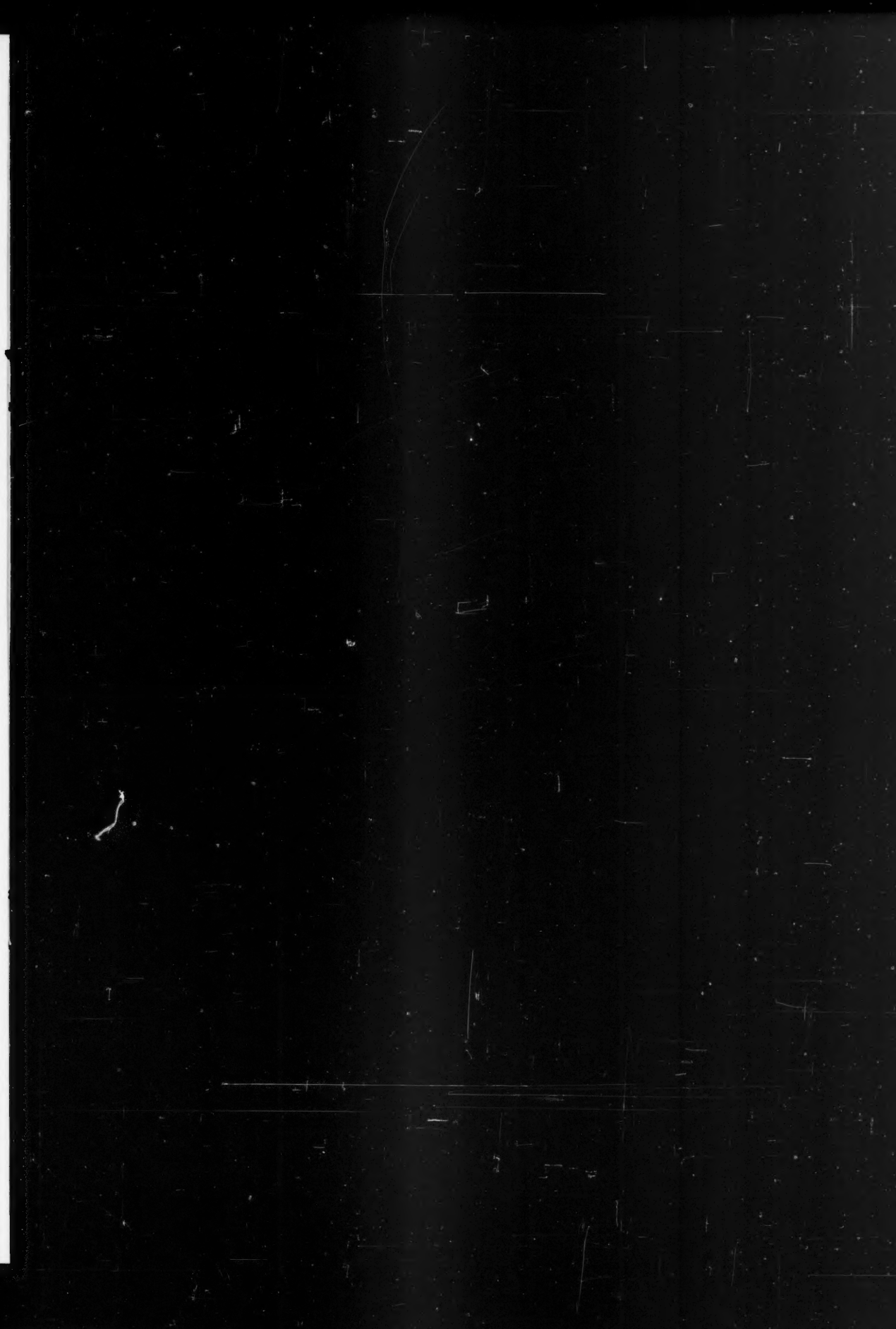
3β-Hydroxyhexanordammaran-20-one from *Euphorbia supina* 3365 R. Tanaka (neé Morita), M. Matsuda and S. Matsunaga

Biomimetic synthesis of 2,3-dioxabicyclo[4,4,0]decanes as plant growth regulators 3367 P. S. Kalsi, J. Singh, W. D. Crow and B. R. Chhabra

Acylresorcinols from seed kernels of *Myristica dactyloides* 3369 N. F. Cooray, E. R. Jansz, S. Wimalasena, T. P. Wijesekera and B. M. Nair

Galipein, a coumarin from *Galipea trifoliata* 3372 K. R. Wirasutisna, J. Gleye, C. Moulis, E. Stanislas and C. Moretti

Glabone, a new furanoflavone from *Pongamia glabra* 3373 P. D. Kanungo, A. Ganguly, A. Guha, A. Bhattacharyya and N. Adityachaudhury

Peptide alkaloids from *Zizyphus* species 3374 S. Devi, V. B. Pandey, J. P. Singh and A. H. Shah

Picrasidine-T, a dimeric β-carboline alkaloid from *Picrasma quassioides*	3375	K. KOIKE, T. OHMOTO and T. HIGUCHI
Book Review		
Progress in Terpene Chemistry: edited by D. JOULAIN	3379	J. R. HANSON
Erratum	3381	
Corrigenda	3381